
Troubleshooting Manual

Models ***T350*** ***T500J***

3121203

September 7, 2005



REVISION LOG

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REVISION LOG

SECTION A. INTRODUCTION

A.1 HOW TO USE THIS MANUAL

Troubleshooting system problems can be difficult. System wiring and hydraulic diagrams are provided in this book to help isolate problems.

Follow the flow chart of Figure A-1.

Each troubleshooting step setup is specified in the step instructions and applies only to that step. **Any special wiring should be removed after completing the step.**

When a function will not operate with the same speed or power as a machine in good working condition, refer to the Troubleshooting By Function topic which most closely describes the problem.

Conclude each session by rerunning the system test, checking for other problems.

If this method does not identify the problem, contact the factory for assistance.

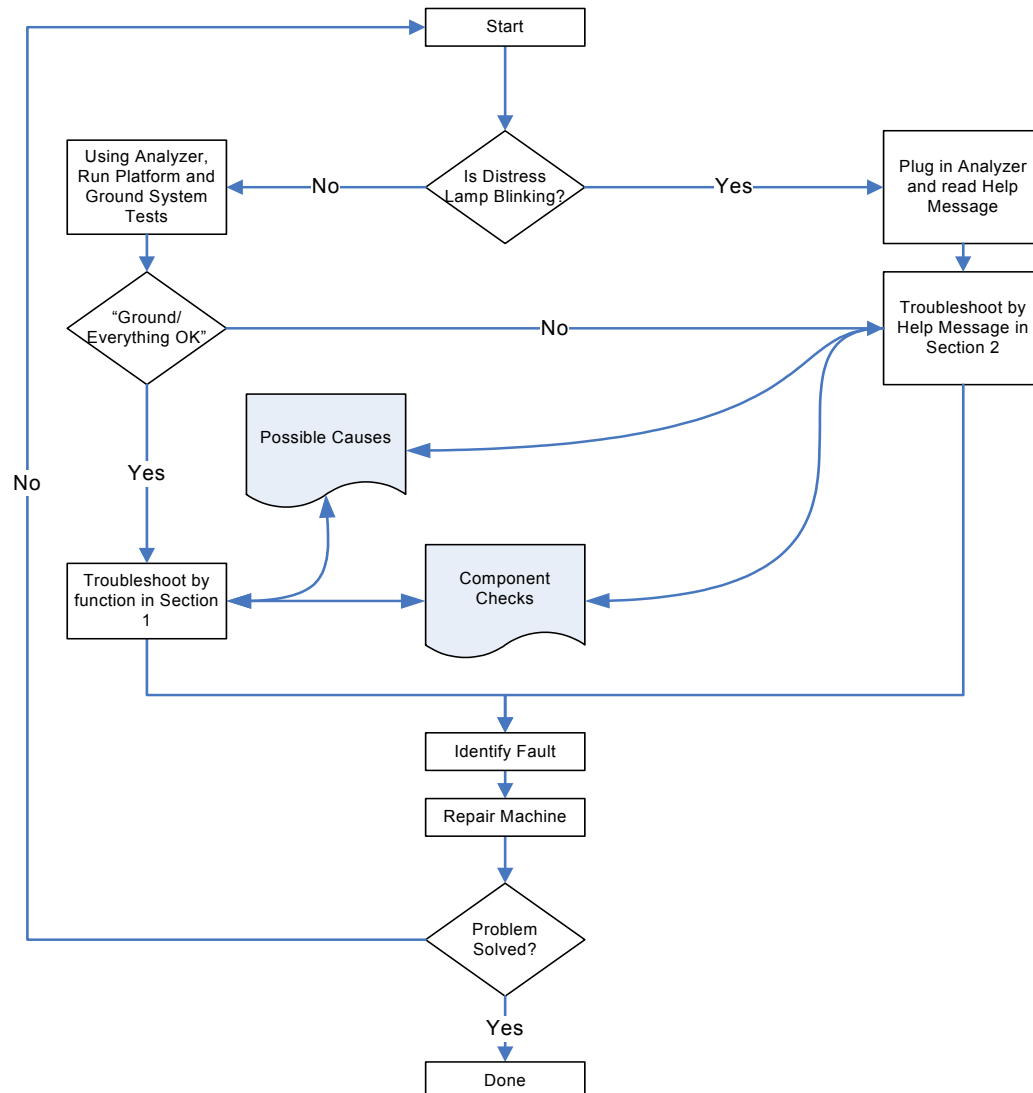


Figure A-1. Troubleshooting Flow Chart

A.2 VISUAL INSPECTION

Perform a thorough visual and “hands on” inspection before starting any troubleshooting procedure. You can quickly find the cause of many problems just by looking.

Has the vehicle been serviced recently? Check that everything has been reconnected properly.

Inspect Hoses for:

- Correct routing
- Pinches and kinks
- Splits, cuts, or breaks.

Inspect Wiring for:

- Contact with sharp edges
- Contact with hot surfaces
- Pinched, burned or chafed insulation
- Proper routing and connections

Check Sensors and Actuators for Damage.

Check Electrical Connectors for:

- Corrosion on pins
- Bent or damaged pins
- Contacts not properly seated in housing
- Bad wire crimps to terminals

A.3 CONNECTOR REFERENCES

Electrical connectors are given a three digit identifier number preceded with “X”. See 7.1 Connector Index for a list.

X404.21 refers to terminal 21 (pin and socket) of connector X404.

X404.21.soc refers to the socket side of terminal 21, connector 404.

X404.21.pin refers to the pin side of terminal 21, connector 404.

A.4 READING FAULT CODES

Current and logged system fault codes can be read from the analyzer. Refer to 9.3 Using the Analyzer

User flash codes can be read from flashes of the ground or platform control panel system distress lamp. Refer to A.5 User Fault Codes.

ADE service flash codes can be read from the green LED on the face of the ground module, see Figure A-2..

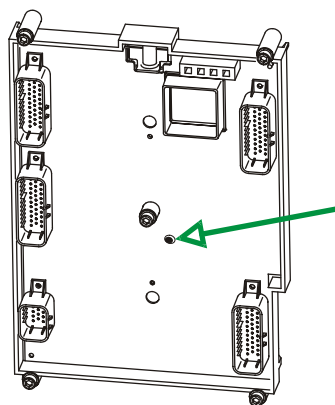


Figure A-2. Ground Module Fault LED

On electric powered machines, power module flash codes can be read from the flashing of the green LED located on the power module as seen in Figure A-3.. Refer to A.8 Power Module Flash Codes for fault descriptions.

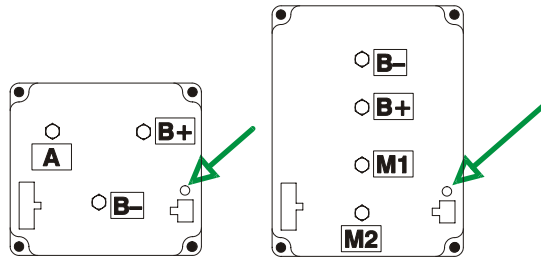


Figure A-3. Power Module Fault LED

A.5 USER FAULT CODES

Flash Code	Description of Difficulty
1	Procedure
2	Vehicle Setup
3	Battery / Charge System
4	Excessive Duty Cycle
5	Start Engine / Turn-Off System
6	Unused
7	Unused
8	Unused
9	Vehicle Requires Service

A.6 USER FAULT CODE CROSS REFERENCES

CODE - MESSAGE	PAGE NO.
0	
Chassis Tilt Sensor Out Of Range	2-46
Running At Creep - Material Hook Mode	2-104
1	
Function Locked Out - Joystick Not Centered At Startup	2-65
Function Locked Out - Trigger Permanently Closed	2-66
Function Problem - Engine Choke Permanently Selected	2-66
.....	2-67
Function Problem - Engine Start Permanently Selected	2-67
.....	2-68
Function Problem - Jib Down Permanently Selected	2-68
Function Problem - Jib Up Permanently Selected	2-69
Function Problem - Level Down Permanently Selected	2-70
Function Problem - Level Up Permanently Selected	2-71
Function Problem - Lift Down Permanently Selected	2-71
Function Problem - Lift Up Permanently Selected	2-72
Function Problem - Outtrigger Set Permanently Selected	2-73
Function Problem - Outtrigger Stow Permanently Selected	2-74
Function Problem - Swing Left Permanently Selected	2-76
Function Problem - Swing Right Permanently Selected	2-76
Function Problem - Telescope In Permanently Selected	2-77
Function Problem - Telescope Out Permanently Selected	2-78
Joystick Moved But Trigger Switch Open	2-85
Trigger Closed Too Long While In Neutral	2-116
2	
Drive & O/R Prevented - Operate From Platform	2-50
Drive & O/R Prevented - Place Boom On Rest	2-51
Drive & O/R Prevented - Set Hand Brake	2-51
Drive Prevented - Lift Down	2-55
Drive Prevented - Stow Outriggers	2-55
Drive Prevented - Telescope In	2-55
Lift Down Prevented - Tele In First	2-90
Lift Up & Tele Out Prevented - Tilted & Above Elevation	2-91
Lift Up & Tele Out Prevented - Tilted,Unset,& Above Elevation	2-92
Lift Up & Tele Out Prevented - Unset & Above Elevation	2-92
Lift Up Prevented - Check Outriggers	2-92
Lift Up Prevented - Lift Down Then Set Outriggers	2-93
Lift Up Prevented - Tilted	2-93
Model Changed - Hydraulics Suspended - Cycle EMS	2-95
Outtrigger Stow Prevented - Tele In First	2-97
Outriggers Prevented - Elevated	2-97
Running At Creep - Tilted & Above Elevation	2-104
Running At Creep - Unset & Above Elevation	2-104
Tele Out Prevented - Set Outriggers	2-109
Tele Out Prevented - Tilted	2-109
3	
Battery Voltage Too High - System Shutdown	2-41
Battery Voltage Too Low - System Shutdown	2-41
No Charge System Output	2-95
4	
Functions At Cutback - Power Module Current Limit	2-78
Power Module Too Hot - Please Wait	2-99
5	
Battery Voltage Too High - System Shutdown	2-41
Battery Voltage Too Low - System Shutdown	2-42
Engine Not Running	2-60

Accessory Fault	2-41
CANBUS Failure - Accessory Module Communications Lost	2-42
CANBUS Failure - Drive Module	2-43
CANBUS Failure - Platform Module	2-44
CANBUS Failure - Power Module	2-45
Chassis Tilt Sensor Gain Not Calibrated	2-45
Chassis Tilt Sensor Gain Out Of Range	2-45
Chassis Tilt Sensor Not Calibrated	2-46
Choke Hold Solenoid Open Circuit	2-47
Choke Hold Solenoid Short To Battery	2-47
Choke Hold Solenoid Short To Ground	2-48
Choke Pull Relay Open Circuit	2-48
Choke Pull Relay Short To Battery	2-49
Choke Pull Relay Short To Ground	2-49
Drive Enable Solenoid Short To Battery	2-51
Drive Enable Solenoid Short To Ground Or Open Circuit	2-52
Drive Left Forward Solenoid Open Circuit	2-52
Drive Left Forward Solenoid Short To Battery	2-53
Drive Left Forward Solenoid Short To Ground	2-53
Drive Left Reverse Solenoid Open Circuit	2-54
Drive Left Reverse Solenoid Short To Battery	2-54
Drive Left Reverse Solenoid Short To Ground	2-55
Drive Right Forward Solenoid Open Circuit	2-56
Drive Right Forward Solenoid Short To Battery	2-56
Drive Right Forward Solenoid Short To Ground	2-57
Drive Right Reverse Solenoid Open Circuit	2-57
Drive Right Reverse Solenoid Short To Battery	2-58
Drive Right Reverse Solenoid Short To Ground	2-58
Dump Solenoid Open Circuit	2-59
Dump Solenoid Short To Battery	2-59
Dump Solenoid Short To Ground	2-60
EEPROM Failure - Check All Settings	2-60
Extend O/R Solenoid Open Circuit	2-61
Extend O/R Solenoid Short To Battery	2-61
Extend O/R Solenoid Short To Ground	2-62
Front-Left O/R Solenoid Open Circuit	2-62
Front-Left O/R Solenoid Short To Battery	2-63
Front-Left O/R Solenoid Short To Ground	2-63
Front-Right O/R Solenoid Open Circuit	2-64
Front-Right O/R Solenoid Short To Battery	2-64
Front-Right O/R Solenoid Short To Ground	2-65
Function Problem - Jib Up And Down Both Selected	2-69
Function Problem - Level Up And Down Both Selected	2-70
Function Problem - Lift Up And Down Both Selected	2-72
Function Problem - Outrigger Set And Stow Both Selected	2-73
Function Problem - Rotary Selector Switch	2-74
Function Problem - Swing Left And Right Both Selected	2-75
Function Problem - Telescope In And Out Both Selected	2-77
Functions Locked Out - Constant Data Version Improper	2-78
Functions Locked Out - Platform Module Software Version Improper	2-78
Functions Locked Out - Power Module Software Version Improper	2-79
Ground Alarm Short To Battery	2-79
Ground Alarm Short To Ground	2-79
Ground Module Failure Ref Voltage Out Of Range	2-80
Ground Module Failure Vlow Fet Failure	2-80
Hourmeter Short To Battery	2-80
Jib Down Solenoid Open Circuit	2-80

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Jib Down Solenoid Short To Battery	2-81
Jib Down Solenoid Short To Ground	2-81
Jib Up Solenoid Open Circuit	2-82
Jib Up Solenoid Short To Battery	2-82
Jib Up Solenoid Short To Ground	2-83
Joystick Faulty - X axis Wiper Out Of Range	2-83
Joystick Faulty - Y axis Wiper Out Of Range	2-84
Keyswitch Faulty	2-86
Level Down Solenoid Open Circuit	2-87
Level Down Solenoid Short To Battery	2-87
Level Down Solenoid Short To Ground	2-88
Level Up Solenoid Open Circuit	2-88
Level Up Solenoid Short To Battery	2-89
Level Up Solenoid Short To Ground	2-89
Lift Down Solenoid Open Circuit	2-90
Lift Down Solenoid Short To Battery	2-91
Lift Down Solenoid Short To Ground	2-91
Lift Up Solenoid Open Circuit	2-94
Lift Up Solenoid Short To Battery	2-94
Lift Up Solenoid Short To Ground	2-95
Open-Circuit Pump Motor Wiring	2-96
Optional Ground Alarm Short To Battery	2-96
Optional Ground Alarm Short To Ground	2-96
Platform Position Detection Faulty	2-97
Power Module Failure Check Power Circuits Or Mosfet Short Circuit	2-98
Power Module Failure Internal Error	2-98
Power Module Failure Personality Range Error	2-99
Rear-Left O/R Solenoid Open Circuit	2-99
Rear-Left O/R Solenoid Short To Battery	2-100
Rear-Left O/R Solenoid Short To Ground	2-100
Rear-Right O/R Solenoid Open Circuit	2-101
Rear-Right O/R Solenoid Short To Battery	2-101
Rear-Right O/R Solenoid Short To Ground	2-102
Retract O/R Solenoid Open Circuit	2-102
Retract O/R Solenoid Short To Battery	2-103
Retract O/R Solenoid Short To Ground	2-103
Start Solenoid Open Circuit	2-105
Start Solenoid Short To Battery	2-105
Start Solenoid Short To Ground	2-106
Swing Left Solenoid Open Circuit	2-106
Swing Left Solenoid Short To Battery	2-107
Swing Left Solenoid Short To Ground	2-107
Swing Right Solenoid Open Circuit	2-108
Swing Right Solenoid Short To Battery	2-108
Swing Right Solenoid Short To Ground	2-109
Telescope In Solenoid Open Circuit	2-110
Telescope In Solenoid Short To Battery	2-110
Telescope In Solenoid Short To Ground	2-111
Telescope Out Solenoid Open Circuit	2-112
Telescope Out Solenoid Short To Battery	2-112
Telescope Out Solenoid Short To Ground	2-113
Throttle Hold Solenoid Open Circuit	2-113
Throttle Hold Solenoid Short To Battery	2-114
Throttle Hold Solenoid Short To Ground	2-114
Throttle Pull Relay Open Circuit	2-115
Throttle Pull Relay Short To Battery	2-115
Throttle Pull Relay Short To Ground	2-116

A.7 SERVICE FAULT CODE CROSS REFERENCES

CODE - MESSAGE	PAGE NO.
0	
0 Chassis Tilt Sensor Out Of Range	2-46
0 Engine Not Running	2-60
0 Joystick Moved But Trigger Switch Open	2-85
0 Running At Creep - Material Hook Mode	2-104
0 Running At Creep - Tilted & Above Elevation	2-104
0 Running At Creep - Unset & Above Elevation	2-104
2-?	
2-1 Keyswitch Faulty	2-86
2-1 Platform Position Detection Faulty	2-97
2-2 Function Locked Out - Joystick Not Centered At Startup	2-65
2-2 Function Locked Out - Trigger Permanently Closed	2-66
2-2 Function Problem - Engine Choke Permanently Selected	2-66
2-2 Function Problem - Engine Start Permanently Selected	2-67
2-2 Function Problem - Rotary Selector Switch	2-74
2-2 Joystick Faulty - X axis Wiper Out Of Range	2-83
2-2 Joystick Faulty - Y axis Wiper Out Of Range	2-84
2-2 Trigger Closed Too Long While In Neutral	2-116
2-3 Function Problem - Engine Choke Permanently Selected	2-67
2-3 Function Problem - Engine Start Permanently Selected	2-68
2-3 Function Problem - Jib Down Permanently Selected	2-68
2-3 Function Problem - Jib Up And Down Both Selected	2-69
2-3 Function Problem - Jib Up Permanently Selected	2-69
2-3 Function Problem - Level Down Permanently Selected	2-70
2-3 Function Problem - Level Up And Down Both Selected	2-70
2-3 Function Problem - Level Up Permanently Selected	2-71
2-3 Function Problem - Lift Down Permanently Selected	2-71
2-3 Function Problem - Lift Up And Down Both Selected	2-72
2-3 Function Problem - Lift Up Permanently Selected	2-72
2-3 Function Problem - Outrigger Set And Stow Both Selected	2-73
2-3 Function Problem - Outrigger Set Permanently Selected	2-73
2-3 Function Problem - Outrigger Stow Permanently Selected	2-74
2-3 Function Problem - Swing Left And Right Both Selected	2-75
2-3 Function Problem - Swing Left Permanently Selected	2-76
2-3 Function Problem - Swing Right Permanently Selected	2-76
2-3 Function Problem - Telescope In And Out Both Selected	2-77
2-3 Function Problem - Telescope In Permanently Selected	2-77
2-3 Function Problem - Telescope Out Permanently Selected	2-78
2-5 Drive & O/R Prevented - Operate From Platform	2-50
2-5 Drive & O/R Prevented - Place Boom On Rest	2-51
2-5 Drive & O/R Prevented - Set Hand Brake	2-51
2-5 Drive Prevented - Lift Down	2-55
2-5 Drive Prevented - Stow Outriggers	2-55
2-5 Drive Prevented - Telescope In	2-55
2-5 Lift Down Prevented - Tele In First	2-90
2-5 Lift Up & Tele Out Prevented - Tilted & Above Elevation	2-91
2-5 Lift Up & Tele Out Prevented - Tilted,Unset,& Above Elevation	2-92
2-5 Lift Up & Tele Out Prevented - Unset & Above Elevation	2-92
2-5 Lift Up Prevented - Check Outriggers	2-92
2-5 Lift Up Prevented - Lift Down Then Set Outriggers	2-93
2-5 Lift Up Prevented - Tilted	2-93
2-5 Model Changed - Hydraulics Suspended - Cycle EMS	2-95
2-5 Outrigger Stow Prevented - Tele In First	2-97
2-5 Outriggers Prevented - Elevated	2-97

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2-5 Tele Out Prevented - Set Outriggers	2-109
2-5 Tele Out Prevented - Tilted	2-109
3-?	
3-3 Choke Hold Solenoid Open Circuit	2-47
3-3 Choke Hold Solenoid Short To Battery	2-47
3-3 Choke Hold Solenoid Short To Ground	2-48
3-3 Choke Pull Relay Open Circuit	2-48
3-3 Choke Pull Relay Short To Battery	2-49
3-3 Choke Pull Relay Short To Ground	2-49
3-3 Drive Enable Solenoid Short To Battery	2-51
3-3 Drive Enable Solenoid Short To Ground Or Open Circuit	2-52
3-3 Drive Left Forward Solenoid Open Circuit	2-52
3-3 Drive Left Forward Solenoid Short To Battery	2-53
3-3 Drive Left Forward Solenoid Short To Ground	2-53
3-3 Drive Left Reverse Solenoid Open Circuit	2-54
3-3 Drive Left Reverse Solenoid Short To Battery	2-54
3-3 Drive Left Reverse Solenoid Short To Ground	2-55
3-3 Drive Right Forward Solenoid Open Circuit	2-56
3-3 Drive Right Forward Solenoid Short To Battery	2-56
3-3 Drive Right Forward Solenoid Short To Ground	2-57
3-3 Drive Right Reverse Solenoid Open Circuit	2-57
3-3 Drive Right Reverse Solenoid Short To Battery	2-58
3-3 Drive Right Reverse Solenoid Short To Ground	2-58
3-3 Dump Solenoid Open Circuit	2-59
3-3 Dump Solenoid Short To Battery	2-59
3-3 Dump Solenoid Short To Ground	2-60
3-3 Extend O/R Solenoid Open Circuit	2-61
3-3 Extend O/R Solenoid Short To Battery	2-61
3-3 Extend O/R Solenoid Short To Ground	2-62
3-3 Front-Left O/R Solenoid Open Circuit	2-62
3-3 Front-Left O/R Solenoid Short To Battery	2-63
3-3 Front-Left O/R Solenoid Short To Ground	2-63
3-3 Front-Right O/R Solenoid Open Circuit	2-64
3-3 Front-Right O/R Solenoid Short To Battery	2-64
3-3 Front-Right O/R Solenoid Short To Ground	2-65
3-3 Ground Alarm Short To Battery	2-79
3-3 Ground Alarm Short To Ground	2-79
3-3 Hourmeter Short To Battery	2-80
3-3 Jib Down Solenoid Open Circuit	2-80
3-3 Jib Down Solenoid Short To Battery	2-81
3-3 Jib Down Solenoid Short To Ground	2-81
3-3 Jib Up Solenoid Open Circuit	2-82
3-3 Jib Up Solenoid Short To Battery	2-82
3-3 Jib Up Solenoid Short To Ground	2-83
3-3 Level Down Solenoid Open Circuit	2-87
3-3 Level Down Solenoid Short To Battery	2-87
3-3 Level Down Solenoid Short To Ground	2-88
3-3 Level Up Solenoid Open Circuit	2-88
3-3 Level Up Solenoid Short To Battery	2-89
3-3 Level Up Solenoid Short To Ground	2-89
3-3 Lift Down Solenoid Open Circuit	2-90
3-3 Lift Down Solenoid Short To Battery	2-91
3-3 Lift Down Solenoid Short To Ground	2-91
3-3 Lift Up Solenoid Open Circuit	2-94
3-3 Lift Up Solenoid Short To Battery	2-94
3-3 Lift Up Solenoid Short To Ground	2-95
3-3 Optional Ground Alarm Short To Battery	2-96
3-3 Optional Ground Alarm Short To Ground	2-96
3-3 Rear-Left O/R Solenoid Open Circuit	2-99

3-3 Rear-Left O/R Solenoid Short To Battery	2-100
3-3 Rear-Left O/R Solenoid Short To Ground	2-100
3-3 Rear-Right O/R Solenoid Open Circuit	2-101
3-3 Rear-Right O/R Solenoid Short To Battery	2-101
3-3 Rear-Right O/R Solenoid Short To Ground	2-102
3-3 Retract O/R Solenoid Open Circuit	2-102
3-3 Retract O/R Solenoid Short To Battery	2-103
3-3 Retract O/R Solenoid Short To Ground	2-103
3-3 Start Solenoid Open Circuit	2-105
3-3 Start Solenoid Short To Battery	2-105
3-3 Start Solenoid Short To Ground	2-106
3-3 Swing Left Solenoid Open Circuit	2-106
3-3 Swing Left Solenoid Short To Battery	2-107
3-3 Swing Left Solenoid Short To Ground	2-107
3-3 Swing Right Solenoid Open Circuit	2-108
3-3 Swing Right Solenoid Short To Battery	2-108
3-3 Swing Right Solenoid Short To Ground	2-109
3-3 Telescope In Solenoid Open Circuit	2-110
3-3 Telescope In Solenoid Short To Battery	2-110
3-3 Telescope In Solenoid Short To Ground	2-111
3-3 Telescope Out Solenoid Open Circuit	2-112
3-3 Telescope Out Solenoid Short To Battery	2-112
3-3 Telescope Out Solenoid Short To Ground	2-113
3-3 Throttle Hold Solenoid Open Circuit	2-113
3-3 Throttle Hold Solenoid Short To Battery	2-114
3-3 Throttle Hold Solenoid Short To Ground	2-114
3-3 Throttle Pull Relay Open Circuit	2-115
3-3 Throttle Pull Relay Short To Battery	2-115
3-3 Throttle Pull Relay Short To Ground	2-116
4-?	
4-2 Functions At Cutback - Power Module Current Limit	2-78
4-2 Power Module Too Hot - Please Wait	2-99
4-3 No Charge System Output	2-95
4-4 Battery Voltage Too High - System Shutdown	2-41
4-4 Battery Voltage Too Low - System Shutdown	2-41
.....	2-42
6-?	
6-6 CANBUS Failure - Accessory Module Communications Lost	2-42
6-6 CANBUS Failure - Drive Module	2-43
6-6 CANBUS Failure - Platform Module	2-44
6-6 CANBUS Failure - Power Module	2-45
6-7 Accessory Fault	2-41
7-?	
7-7 Open-Circuit Pump Motor Wiring	2-96
8-?	
8-1 Chassis Tilt Sensor Not Calibrated	2-46
9-?	
9-9 Chassis Tilt Sensor Gain Not Calibrated	2-45
9-9 Chassis Tilt Sensor Gain Out Of Range	2-45
9-9 EEPROM Failure - Check All Settings	2-60
9-9 Functions Locked Out - Constant Data Version Improper	2-78
9-9 Functions Locked Out - Platform Module Software Version Improper	2-78
9-9 Functions Locked Out - Power Module Software Version Improper	2-79
9-9 Ground Module Failure Ref Voltage Out Of Range	2-80
9-9 Ground Module Failure Vlow Fet Failure	2-80
9-9 Power Module Failure Check Power Circuits Or Mosfet Short Circuit	2-98
9-9 Power Module Failure Internal Error	2-98

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9-9 Power Module Failure Personality Range Error 2-99

A.8 POWER MODULE FLASH CODES

FLASH CODE	FAULT DESCRIPTION	TROUBLESHOOTING REFERENCE
Steady - No Fault		
Off -	Internal Failure, Controller Damaged	2.125 Power Module Failure: Check Power Circuits Or Mosfet Short Circuit
1 -	Personality Out Of Range Or CRC Fault	2.127 Power Module Failure: Personality Range Error
2 -	Input Active On Power Up Or Undefined Input	2.126 Power Module Failure: Internal Error
3 -	Short Circuit Detected In Power Block	2.125 Power Module Failure: Check Power Circuits Or Mosfet Short Circuit
4 -	Line Contactor Not Responding To Command	
5 -	Field Loss Detected	
6 -	Reserved	
7 -	Battery Voltage High or Low	2.3 Battery Voltage Too High - System Shutdown, 2.4 Battery Voltage Too Low - System Shutdown
8 -	Controller Hot	2.79 Functions At Cutback - Power Module Current Limit, 2.128 Power Module Too Hot - Please Wait
9 -	Reserved	
10 -	Communication Loss	2.9 CANBUS Failure - Power Module
11 -	System Condition Out Of Range	2.126 Power Module Failure: Internal Error

A.9 GROUND REFERENCE

On engine powered machines, battery negative (X100) should be used as the ground reference for voltage measurements, unless stated otherwise.

On electric powered machines, the power module B- (X101) terminal should be used as the ground reference for voltage measurements, unless stated otherwise.

A.10 CONTROL MODULE POWER

Always make sure that the ground control module is properly powered.

1. For Ground operation, Pins J001.24, X007.3, and X008.2 should have a voltage of Vbatt. Pin X008.1 should be grounded.
2. For Platform operation, Pins J001.24, X007.1, X007.2, X008.2, and X060.1 should have a voltage of Vbatt. Pins X008.1 and X060.2 should be grounded.

CAN communication wires should have 60 Ohms resistance between CAN HI and CAN LO whenever connected or 120 Ohms when disconnected. A CAN termination 120 Ohm resistor is located at both ends of the CAN bus. One is in the wire harness near the platform at X057. The other terminator is embedded in the power module for electric powered machines or the ground module for engine powered machines. The jumper in the engine powered machine harness between X007.6 and X007.17 enables the ground module termination resistor.

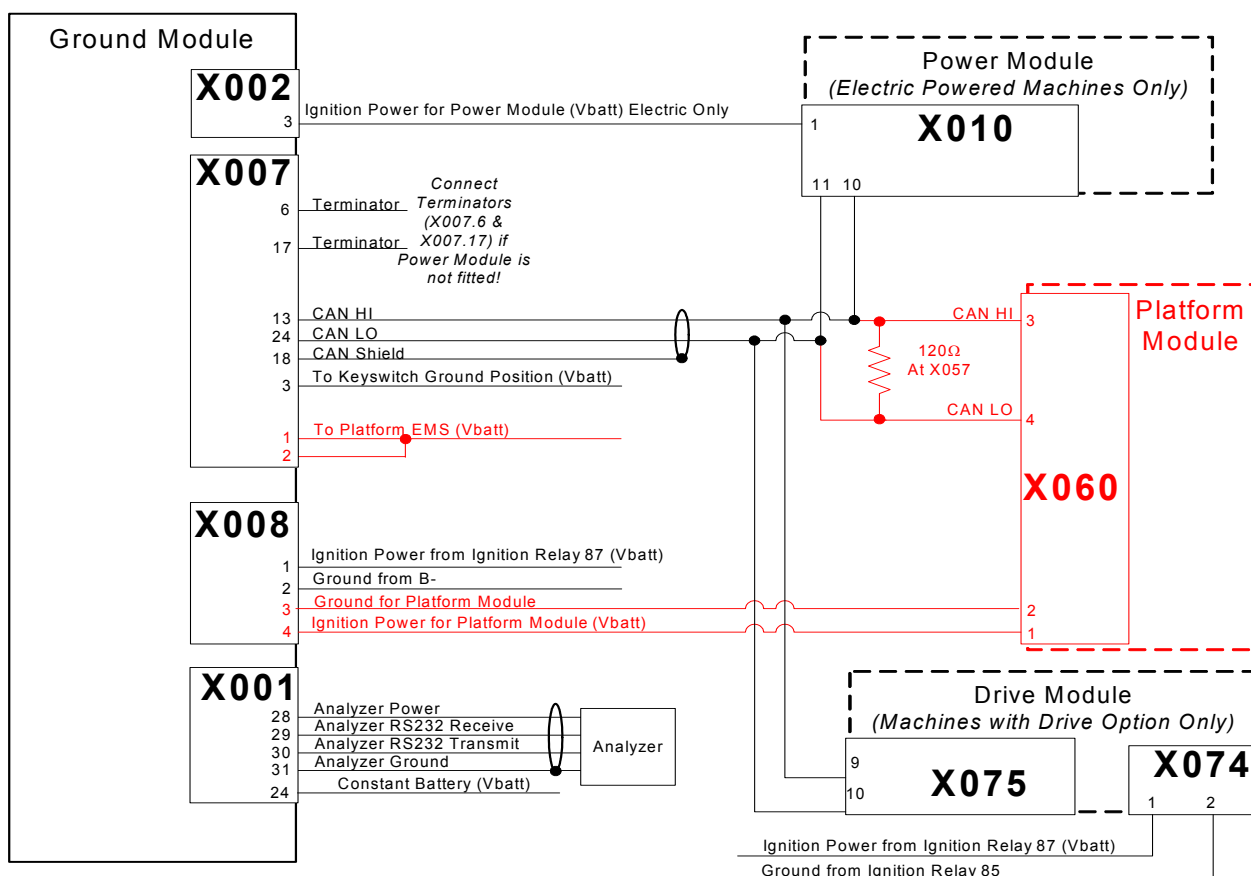


Figure A-4. Basic Electronic Module Connections

A.11 TILT

X and Y axis tilt are combined through a calculation to form the tilt value used by the control system. The machine is considered "Tilted" whenever this calculated tilt value is above 2 degrees from calibrated level, zero tilt.

An outrigger is considered set when the pivot pin slides up and closes the outrigger limit switch.

The ground control panel outrigger LEDs blink whenever they are set, but the machine is tilted. Once the outriggers are set and the machine is not tilted, the outrigger LEDs remain on, steady.

The platform outrigger LED blinks till all four outriggers are set, then lights steady. The platform tilt LED lights whenever the machine is tilted.

Orientation

The Ground Module shall be mounted such that the Tilt Sensor's X-Axis responds to Side-to-Side tilt of the vehicle, while the Y-Axis responds to Front-to-Back tilt of the vehicle. The following table is offered to clarify orientation.

Orientation	Tilt Sensor Response
Raise Tongue of Vehicle	Y-Axis -
Lower Tongue of Vehicle	Y-Axis +
Raise Left Side of Vehicle	X-Axis -
Raise Right Side of Vehicle	X-Axis +

A.12 CRITICAL VEHICLE INTERLOCK SCENARIOS

The following scenarios have been identified that require unique vehicle interlocks. For readability, the circumstances involved with entering and leaving these situations have been isolated here.

RETRIEVAL-A

Retrieval-A forces the user to stow the boom if the Tilt Warning is ignored and critical stability situations are reached. This scenario is INACTIVE at Power-up.

It becomes ACTIVE when the machine is ELEVATED (transport switch OPEN) AND CRITICALLY TILTED 4.5 degrees or more. It is INACTIVE otherwise.

RETRIEVAL-B

Retrieval-B forces the user to stow the boom if the Outrigger Unset Warning is ignored and critical stability situations are reached. This scenario is INACTIVE at Power-up.

It becomes ACTIVE under the following circumstances. It is INACTIVE otherwise.

- The vehicle is Elevated AND One Outrigger is Unset AND the vehicle is TILTED
- The vehicle is Elevated AND Two Outriggers are UNSET.

A.13 OUTRIGGERS

Some machine software may refer to the Outriggers (O/R) as Lifting Jacks (L/J).

SECTION B. TROUBLESHOOTING SAFETY PRECAUTIONS

B.1 GENERAL

This section contains the general safety precautions which must be observed during troubleshooting of the aerial platform. It is of utmost importance that maintenance personnel pay strict attention to these warnings and precautions to avoid possible injury to themselves or others, or damage to the equipment. A maintenance program must be followed to ensure that the machine is safe to operate.

WARNING

MODIFICATION OF THE MACHINE WITHOUT CERTIFICATION BY A RESPONSIBLE AUTHORITY THAT THE MACHINE IS AT LEAST AS SAFE AS ORIGINALLY MANUFACTURED, IS A SAFETY VIOLATION.

The specific precautions to be observed during troubleshooting are inserted at the appropriate point in the manual. These precautions are, for the most part, those that apply when servicing hydraulic and larger machine component parts.

Your safety, and that of others, is the first consideration when engaging in the troubleshooting of equipment. Always be conscious of weight. Never attempt to move heavy parts without the aid of a mechanical device. Do not allow heavy objects to rest in an unstable position. When raising a portion of the equipment, ensure that adequate support is provided.

WARNING

SINCE THE MACHINE MANUFACTURER HAS NO DIRECT CONTROL OVER TROUBLESHOOTING, SAFETY IN THIS AREA IS THE RESPONSIBILITY OF THE OWNER/OPERATOR.

B.2 HYDRAULIC SYSTEM SAFETY

It should be noted that the machines hydraulic systems operate at extremely high potentially dangerous pressures. Every effort should be made to relieve any system pressure prior to disconnecting or removing any portion of the system.

B.3 TROUBLESHOOTING SAFETY

WARNING

FAILURE TO COMPLY WITH SAFETY PRECAUTIONS LISTED IN THIS SECTION MAY RESULT IN MACHINE DAMAGE, PERSONNEL INJURY OR DEATH AND IS A SAFETY VIOLATION.

- NO SMOKING IS MANDATORY. NEVER REFUEL DURING ELECTRICAL STORMS. ENSURE THAT FUEL CAP IS CLOSED AND SECURE AT ALL OTHER TIMES.
- REMOVE ALL RINGS, WATCHES AND JEWELRY WHEN PERFORMING ANY TROUBLESHOOTING.
- DO NOT WEAR LONG HAIR UNRESTRAINED, OR LOOSE-FITTING CLOTHING AND NECKTIES WHICH ARE APT TO BECOME CAUGHT ON OR ENTANGLED IN EQUIPMENT.
- OBSERVE AND OBEY ALL WARNINGS AND CAUTIONS ON MACHINE AND IN SERVICE AND OPERATORS MANUALS.
- KEEP OIL, GREASE, WATER, ETC. WIPED FROM STANDING SURFACES AND HAND HOLDS.
- USE CAUTION WHEN CHECKING A HOT, PRESSURIZED COOLANT SYSTEM.
- NEVER WORK UNDER AN ELEVATED BOOM UNTIL BOOM HAS BEEN SAFELY RESTRAINED FROM ANY MOVEMENT BY BLOCKING OR OVERHEAD SLING, OR BOOM SAFETY PROP HAS BEEN ENGAGED.
- A machine that is damaged or malfunctioning should immediately be tagged and removed from service.
- Repair any machine damage or malfunction before operating the machine.
- Unless otherwise specified, perform any troubleshooting procedure with the machine parked on a flat level surface, boom stowed, key switch off and key removed, park brake applied.
- BATTERY SHOULD ALWAYS BE DISCONNECTED DURING REPLACEMENT OF ELECTRICAL COMPONENTS.
- KEEP ALL SUPPORT EQUIPMENT AND ATTACHMENTS STOWED IN THEIR PROPER PLACE.
- USE ONLY APPROVED, NONFLAMMABLE CLEANING SOLVENTS.

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SECTION 1. TROUBLESHOOTING BY FUNCTION

1.1 ALL FUNCTIONS INOPERATIVE

Step	Pretest Instructions	Test	Result	Corrective Action
1.1.1		Basic check of likely causes		Possible Causes: 4.1.66, 4.1.67, 4.1.68
1.1.2		Do panel indicator lights blink at power-on?	Yes No	Go to step 1.1.3 Ground controller not powered. Perform component check: 3.2 DC Powered Machine - Power or 3.7 Engine Powered Machine - Power
1.1.3		Try both ground and platform controls	One set of controls functions Both sets of control inoperable	See 1.10 Ground Controls Inoperative or 1.11 Platform Controls Inoperative Go to step 1.1.4
1.1.4		Is the hydraulic pump motor running while activating a function?	Yes No	Go to step 1.1.5 Perform component check: 3.1 DC Powered Machine - Hydraulic Pump or 3.6 Engine Powered Machine - Hydraulic Pump
1.1.5	Connect a 0-5000 PSI pressure gauge at the manifold "G" port	While holding enable and lift up switch, does pressure rise above 100PSI (minimum function pressure)?	Yes No	Possible Causes: 4.1.37, 4.1.47 Go to step 1.1.6
1.1.6	Plumb a 0 to 5000 PSI (345 bar) pressure gauge into the manifold P port	While holding enable and lift up switch, does pressure rise above 100PSI (minimum function pressure)?	Yes No	Possible Causes: 4.1.40, 4.1.10, 4.1.47 Possible Causes: 4.1.37, 4.1.45, 4.1.74, 4.1.75, 4.1.39

1.2 PUMP MOTOR WILL NOT OPERATE - DC POWERED MODELS

Step	Pretest Instructions	Test	Result	Corrective Action
1.2.1		Voltage between B+ and B- (X102 and X101) = Vbatt?	Yes No	Go to step 1.2.2 See 3.2 DC Powered Machine - Power
1.2.2	Engage enable and lift up switch	Voltage between M1 and M2 (X103 and X104) = Vbatt?	Yes No	Go to step 1.2.3 Possible Causes: 4.1.12
1.2.3	Engage enable and lift up switch	Voltage between X115 and X114 = Vbatt?	Yes No	Possible Causes: 4.1.69 Go to step 1.2.4
1.2.4	Engage enable and lift up switch	Voltage between X115 and X101 = Vbatt?	Yes No	Go to step 1.2.5 Possible Causes: 4.1.70, 4.1.72, 4.1.12
1.2.5	Engage enable and lift up switch	Voltage between X114 and X102 = Vbatt?	Yes No	Possible Causes: 4.1.12 Possible Causes: 4.1.71, 4.1.72, 4.1.12

1.3 ALL FUNCTIONS INOPERATIVE, ENGINE STARTS AND RUNS - ENGINE MODELS

Step	Pretest Instructions	Test	Result	Corrective Action
1.3.1		Basic check of likely causes		Possible Causes: 4.1.68
1.3.2		Try both ground and platform controls	One set of controls functions Both sets of control inoperable	See 1.10 Ground Controls Inoperative or 1.11 Platform Controls Inoperative Go to step 1.3.3
1.3.3		Is the hydraulic pump turning with the engine?	Yes No	Go to step 1.3.4 Perform component check: 3.6 Engine Powered Machine - Hydraulic Pump
1.3.4	Connect a 0-5000 PSI pressure gauge at the manifold "G" port	While holding enable and lift up switch, does pressure rise above 100PSI (minimum function pressure)?	Yes No	Possible Causes: 4.1.37, 4.1.47 Go to step 1.3.5
1.3.5	Plumb a 0 to 5000 PSI (345 bar) pressure gauge into the manifold P port	While holding enable and lift up switch, does pressure rise above 100PSI (minimum function pressure)?	Yes No	Possible Causes: 4.1.40, 4.1.10, 4.1.47 Possible Causes: 4.1.37, 4.1.45, 4.1.74, 4.1.75, 4.1.39

1.4 ALL FUNCTIONS INOPERATIVE, PUMP MOTOR RUNS - DC POWERED MODELS

Step	Pretest Instructions	Test	Result	Corrective Action
1.4.1		Basic check of likely causes		Possible Causes: 4.1.68
1.4.2		Try both ground and platform controls	One set of controls functions Both sets of control inoperable	See 1.10 Ground Controls Inoperative or 1.11 Platform Controls Inoperative Go to step 1.4.3
1.4.3	Connect a 0-5000 PSI pressure gauge at the manifold "G" port	While holding enable and lift up switch, does pressure rise above 100PSI (minimum function pressure)?	Yes No	Possible Causes: 4.1.37, 4.1.47 Go to step 1.4.4
1.4.4	Plumb a 0 to 5000 PSI (345 bar) pressure gauge into the manifold P port	While holding enable and lift up switch, does pressure rise above 100PSI (minimum function pressure)?	Yes No	Possible Causes: 4.1.40, 4.1.10, 4.1.47 Possible Causes: 4.1.37, 4.1.45, 4.1.39

1.5 BATTERY CHARGER NOT FUNCTIONING PROPERLY

Delta-Q Charger Normal Operation Description

Stage	Description
Startup	The charger will automatically turn on and go through a short self-test with the LED indicator alternating red-green for two seconds. If the charger is connected to a battery pack, a trickle current will be applied until a minimum voltage is reached. If the charger is used in an off-board application and the charger is waiting to be plugged into a battery pack, the charging algorithm number will be displayed for 11 seconds before ultimately displaying an under-voltage fault (fault disappears when plugged into battery pack). Typically lasts from 5 seconds to 2 ½ minutes.
Bulk	Typically, 80% of the total recharge is restored during the bulk phase where a constant 25 Amp output is being delivered. This time varies depending upon the depth of discharge.
Absorption	Output reduced to prevent sulfation build up. Time depends upon the initial level of battery charge and varies from 1 hour minimum to 5 ½ hours. At completion of this phase, 90% charge has been obtained.
Finish	Delivers 6A for at least 1 hour to finish charge.

There will be a cut back in output any time the charger is below 108 VAC. ANY interruption where there is power loss causes the charger to reset. If left plugged in, the charger will restart in 30 days or when the Voltage drops

Battery Charge Level and Normal Charging Time

Number of Cycles	Battery Charge Level	Recharge time (hours)
15	75% (24.8V)	12
30	50% (24.2V)	13.1
50	20% (23.4V)	14.7
66	0% (less than 23.2V)	15

Step	Pretest Instructions	Test	Result	Corrective Action
1.5.1		Does charger go through proper LED sequencing upon start up?	Yes No	Go to step 1.5.2 Check AC power supply.
1.5.2		Is the red LED on?	Yes No	Possible Causes: 4.1.1, 4.1.3, 4.1.4 Do some function to cause draw on the battery, then start again. Otherwise, go to step 1.5.3
1.5.3	Check the voltage on each battery. 25% - 6.12 V, 100% = 6.32 V	Do all batteries have at least 6.12V?	Yes No	Go to step 1.5.4 Possible Causes: 4.1.4
1.5.4	Using a hydrometer - Check the specific gravity in each battery cell. 25% charged is 1.155, 100% = 1.265	Is the specific gravity of all battery cells between 1.155 and 1.265?	Yes No	Possible Causes: 4.1.8 Possible Causes: 4.1.4

1.6 ENGINE WILL NOT CRANK - ENGINE MODELS

Engine starting is only allowed for engine powered machines when the engine speed feedback is zero.

Step	Pretest Instructions	Test	Result	Corrective Action
1.6.1		Do panel indicator lights blink at power-on?	Yes No	Go to step 1.6.2 Ground controller not powered. Perform component check: 3.7 Engine Powered Machine - Power
1.6.2		Is Analyzer DIAGNOSTICS -> SYSTEM -> BATTERY at least 9 Volts?	Yes No	Go to step 1.6.3 Possible Causes: 4.1.4
1.6.3		Voltage at X096.6 = Vbatt?	Yes No	Go to step 1.6.4 Replace engine solenoid fuse at X088
1.6.4		Does engine turn with manual recoil?	Yes No	Go to step 1.6.5 Possible Causes: 4.1.76
1.6.5		Analyzer DIAGNOSTICS -> ENGINE -> SPEED = 0 RPM?	Yes No	Go to step 1.6.6 Possible Causes: 4.1.82-Remove X001.16 to verify, 4.1.21, 4.1.30, 4.1.10
1.6.6		While pressing the start button, Voltage on X089 starter solenoid = Vbatt?	Yes No	Possible Causes: 4.1.77 Go to step 1.6.7
1.6.7		While pressing the start button, Voltage on X022.6 = Vbatt?	Yes No	Possible Cause: Broken Wht/Yel 48-6 wire between X022.6 and solenoid Go to step 1.6.8
1.6.8		While pressing the start button, Voltage on X002.23 = Vbatt?	Yes No	Possible Cause: Broken Wht/Yel 48-6 wire between X002.23 and X022.6 Possible Causes: 4.1.2, 4.1.10

1.7 ENGINE CRANKS BUT WILL NOT START - ENGINE MODELS

Step	Pretest Instructions	Test	Result	Corrective Action
1.7.1		Basic check of likely causes		Possible Causes: 4.1.83, 4.1.84, 4.1.85, 4.1.86, 4.1.87, 4.1.88, 4.1.91
1.7.2		Does engine start with manual recoil?	Yes No	Possible Causes: Check start motor wiring, 4.1.4, 4.1.79 Go to step 1.7.3
1.7.3	Turn key switch to ground position and pull the emergency stop	Is X090.87a black wire, shorted to ground?	Yes No	Go to step 1.7.4 Possible Causes: 4.1.92, 4.1.93
1.7.4	Turn key switch to ground position and pull the emergency stop	Is the Voltage between X090.86 and X090.85 = Vbatt?	Yes No	Possible Causes: 4.1.81 Go to step 1.7.5
1.7.5	Turn key switch to ground position and pull the emergency stop	Is the Voltage on X022.2 = Vbatt?	Yes No	Possible Causes: Broken Yel/Red 2-3 between X022.2 and X090.86, Broken black ground wire on X090.85 Possible Causes: Broken Yel/Red 2-3 wire between X022.2 and X009.87, See 3.9 Ignition Relay - Power

1.8 ENGINE HIGH IDLE INOPERATIVE - ENGINE MODELS

The throttle solenoid engages the engine throttle to high speed. To actuate the throttle solenoid, the Ground Module Engine Throttle Hold output is turned on continuously while the Ground Module Engine Throttle Pull output is momentarily turned on, energizing the Engine Throttle Pull Relay to provide higher current to the throttle solenoid while pulling. The Engine Throttle Hold output remains on during a function and an additional 1 second afterwards, as well as 5 seconds after engine startup.

Step	Pretest Instructions	Test	Result	Corrective Action
1.8.1	Turn key switch to ground position and pull the emergency stop. Engine Running	Does voltage at X097.2 (Wht/Yel 48-2-1) = Vbatt momentarily when operating Lift Up?	Yes No	Go to step 1.8.3 Go to step 1.8.2
1.8.2	Turn key switch to ground position and pull the emergency stop	Does voltage at X091.86 (Wht/Yel 48-2) = Vbatt momentarily when operating Lift Up?	Yes No	Possible Causes: Fusible link from B+ to X091.30 broken, Throttle Pull Diode at X097 Bad, 4.1.80 Possible Causes: Wht/Yel 48-2 wire from X003.9 to X022.3 or X022.3 to X091.86 broken, 4.1.10
1.8.3	Turn key switch to ground position and pull the emergency stop	Does voltage at X097.1 (Wht/Yel 48-3) = Vbatt when operating Lift Up?	Yes No	Possible Causes: Throttle cable froze or binding, Engine throttle stuck, 4.1.78 Possible Causes: Wht/Yel 48-3 wire from X003.11 to X022.4 or X022.4 to X097.1 broken, 4.1.10

1.9 ENGINE LOW IDLE INOPERATIVE - ENGINE MODELS

Possible Causes: 4.1.83, 4.1.84, 4.1.85, 4.1.86, 4.1.90, 4.1.89, 4.1.93

1.10 GROUND CONTROLS INOPERATIVE

Step	Pretest Instructions	Test	Result	Corrective Action
1.10.1		Do panel indicator lights blink at power-on? (Normal 3 second wakeup alarm should also sound)	Yes No	Possible Causes: Check the Analyzer connection and look for faults again, 4.1.18, 4.1.10 Ground controller not powered. Perform component check: 3.2 DC Powered Machine - Power or 3.7 Engine Powered Machine - Power

1.11 PLATFORM CONTROLS INOPERATIVE

Step	Pretest Instructions	Test	Result	Corrective Action
1.11.1		Do panel indicator lights blink at power-on? (Normal 3 second wakeup alarm should also sound)	Yes No	Go to step 1.11.2 Platform controller not powered. Perform component check: 3.13 Platform Module - Power
1.11.2	Place key switch in platform position and pull the emergency stop switches. Engage and hold the trigger.	Measured voltage at X061.6 = Vbatt?	Yes No	Possible Causes: 4.1.38, Rotary Select switch may be defective, See 2.96 Joystick Moved But Trigger Switch Open Joystick trigger switch may be defective, See 2.96 Joystick Moved But Trigger Switch Open

1.12 GROUND LEVELING NOT FUNCTIONING PROPERLY

The ground module uses its embedded tilt sensor and feedback from the outrigger switches to automatically level the machine when the outrigger extend switch is held. It will first try extending the appropriate outriggers to achieve level. If the switch is still held and level is not yet achieved, it will try retracting the appropriate outriggers to achieve level. If the ground is too uneven or the slope is too great, the outriggers will not be able to level the machine.

Step	Pretest Instructions	Test	Result	Corrective Action
1.12.1		Basic check of likely causes		Possible Causes: 4.1.37, 4.1.34, 4.1.36, 4.1.35
1.12.2		ANALYZER -> DIAGNOSTICS -> GROUND -> Outrigger switch indicators agree with O/R positions?	Yes No	Go to step 1.12.3 Possible Causes: 4.1.20, 4.1.19, 4.1.18, 4.1.36
1.12.3		Are some outriggers operating properly?	Yes No	Possible Causes: 4.1.62, 4.1.10 Possible Causes: 4.1.63, 4.1.62, 4.1.10

1.13 LIFT DOWN FUNCTION INOPERATIVE

Step	Pretest Instructions	Test	Result	Corrective Action
1.13.1		Basic check of likely causes		Possible Causes: 4.1.33, 4.1.37, 4.1.49
1.13.2		Does Manual Descent lower the boom?	Yes No	Possible Causes: 4.1.38, 4.1.59, 4.1.48, 4.1.10 Possible Causes: 4.1.41, 4.1.47, 4.1.10

1.14 LIFT UP FUNCTION INOPERATIVE

Step	Pretest Instructions	Test	Result	Corrective Action
1.14.1		Basic check of likely causes		Possible Causes: 4.1.32, 4.1.33, 4.1.37
1.14.2	Engage enable and lift up switch	DC - Is pump motor running? Gas - Is engine running at high idle	Yes No Yes No	Go to step 1.14.3 See 1.2 Pump Motor Will Not Operate - DC Powered Models Go to step 1.14.3 See 1.8 Engine High Idle Inoperative - Engine Models
1.14.3	Install a 0 to 5000 PSI (345 bar) pressure gauge at the manifold G port	Engage the enable and Lift up switch. Check the pressure.	Above Min. Lift Up Pressure psi (bar) Below Min. Lift Up Pressure psi (bar)	Go to step 1.14.5 Go to step 1.14.4
1.14.4	Plumb a 0 to 5000 PSI (345 bar) pressure gauge into the manifold P port	Engage the enable and Lift up switch. Check pressure at manifold P port	Above Min. Lift Up Pressure psi (bar) Below Min. Lift Up Pressure psi (bar)	Possible Causes: 4.1.38, 4.1.45, 4.1.74, 4.1.40, 4.1.10, 4.1.43 Possible Causes: 4.1.10, 4.1.46, 4.1.47, 4.1.74, 4.1.45, 4.1.39
1.14.5	Plumb a 0 to 5000 PSI (345 bar) pressure gauge into the hose from the lift up cylinder cap end.	Check pressure at lift cylinder while activating lift up at ground controls	Above Min. Lift Up Pressure psi (bar) Below Min. Lift Up Pressure psi (bar)	Possible Causes: 4.1.49, 4.1.48, 4.1.41 Possible Causes: 4.1.42, 4.1.58

1.15 TELESCOPE OUT FUNCTION INOPERATIVE

Step	Pretest Instructions	Test	Result	Corrective Action
1.15.1		Basic check of likely causes		Possible Causes: 4.1.32, 4.1.33, 4.1.37
1.15.2	Engage enable and telescope out switch	DC - Is pump motor running? Gas - Is engine running at high idle	Yes No Yes No	Go to step 1.15.3 See 1.2 Pump Motor Will Not Operate - DC Powered Models Go to step 1.15.3 See 1.8 Engine High Idle Inoperative - Engine Models
1.15.3	Install a 0 to 5000 PSI (345 bar) pressure gauge at the manifold G port	Engage the enable and Telescope Out switch. Check the pressure.	Above Min. Tele Out Pressure psi (bar) Below Min. Tele Out Pressure psi (bar)	Go to step 1.15.5 Go to step 1.15.4
1.15.4	Plumb a 0 to 5000 PSI (345 bar) pressure gauge into the manifold P port	Engage the enable and Telescope Out switch. Check pressure at manifold P port	Above Min. Tele Out Pressure psi (bar) Below Min. Tele Out Pressure psi (bar)	Possible Causes: 4.1.38, 4.1.45, 4.1.74, 4.1.40, 4.1.10, 4.1.43 Possible Causes: 4.1.10, 4.1.46, 4.1.47, 4.1.74, 4.1.45, 4.1.39
1.15.5	Plumb a 0 to 5000 PSI (345 bar) pressure gauge into the hose from the lift up cylinder cap end.	Check pressure at the telescope cylinder while activating telescope out at ground controls	Above Min. Tele Out Pressure psi (bar) Below Min. Tele Out Pressure psi (bar)	Possible Causes: 4.1.49, 4.1.48, 4.1.41 Possible Causes: 4.1.42, 4.1.50

1.16 TELESCOPE IN FUNCTION INOPERATIVE

Step	Pretest Instructions	Test	Result	Corrective Action
1.16.1		Basic check of likely causes		Possible Causes: 4.1.32, 4.1.33, 4.1.37
1.16.2	Engage enable and telescope in switch	DC - Is pump motor running? Gas - Is engine running at high idle	Yes No Yes No	Go to step 1.16.3 See 1.2 Pump Motor Will Not Operate - DC Powered Models Go to step 1.16.3 See 1.8 Engine High Idle Inoperative - Engine Models
1.16.3	Install a 0 to 5000 PSI (345 bar) pressure gauge at the manifold G port	Engage the enable and Telescope in switch. Check the pressure.	Above Min. Tele In Pressure psi (bar) Below Min. Tele In Pressure psi (bar)	Go to step 1.16.5 Go to step 1.16.4
1.16.4	Plumb a 0 to 5000 PSI (345 bar) pressure gauge into the manifold P port	Engage the enable and Telescope in switch. Check pressure at manifold P port	Above Min. Tele In Pressure psi (bar) Below Min. Tele In Pressure psi (bar)	Possible Causes: 4.1.38, 4.1.45, 4.1.74, 4.1.40, 4.1.10, 4.1.43 Possible Causes: 4.1.10, 4.1.46, 4.1.47, 4.1.74, 4.1.45, 4.1.39
1.16.5	Plumb a 0 to 5000 PSI (345 bar) pressure gauge into the hose from the lift up cylinder cap end.	Check pressure at the telescope cylinder while activating telescope in at ground controls	Above Min. Tele In Pressure psi (bar) Below Min. Tele In Pressure psi (bar)	Possible Causes: 4.1.49, 4.1.48, 4.1.41 Possible Causes: 4.1.42, 4.1.51

1.17 SWING LEFT FUNCTION INOPERATIVE

Step	Pretest Instructions	Test	Result	Corrective Action
1.17.1		Basic check of likely causes		Possible Causes: 4.1.32, 4.1.33, 4.1.37
1.17.2	Engage enable and swing left switch	DC - Is pump motor running? Gas - Is engine running at high idle	Yes No Yes No	Go to step 1.17.3 See 1.2 Pump Motor Will Not Operate - DC Powered Models Go to step 1.17.3 See 1.8 Engine High Idle Inoperative - Engine Models
1.17.3	Install a 0 to 5000 PSI (345 bar) pressure gauge at the manifold G port	Engage the enable and swing left switch. Check the pressure.	Above Min. Swing Left Pressure psi (bar) Below Min. Swing Left Pressure psi (bar)	Go to step 1.17.5 Go to step 1.17.4
1.17.4	Plumb a 0 to 5000 PSI (345 bar) pressure gauge into the manifold P port	Engage the enable and swing left switch. Check pressure at manifold P port	Above Min. Swing Left Pressure psi (bar) Below Min. Swing Left Pressure psi (bar)	Possible Causes: 4.1.38, 4.1.45, 4.1.74, 4.1.40, 4.1.10, 4.1.43 Possible Causes: 4.1.10, 4.1.46, 4.1.47, 4.1.74, 4.1.45, 4.1.39
1.17.5	Plumb a 0 to 5000 PSI (345 bar) pressure gauge into the hose from the swing motor.	Check pressure at the swing motor while activating swing left at ground controls	Above Min. Swing Left Pressure psi (bar) Below Min. Swing Left Pressure psi (bar)	Possible Causes: 4.1.49, 4.1.48, 4.1.41 Possible Causes: 4.1.42, 4.1.53

1.18 SWING RIGHT FUNCTION INOPERATIVE

Step	Pretest Instructions	Test	Result	Corrective Action
1.18.1		Basic check of likely causes		Possible Causes: 4.1.32, 4.1.33, 4.1.37
1.18.2	Engage enable and swing right switch	DC - Is pump motor running? Gas - Is engine running at high idle	Yes No Yes No	Go to step 1.18.3 See 1.2 Pump Motor Will Not Operate - DC Powered Models Go to step 1.18.3 See 1.8 Engine High Idle Inoperative - Engine Models
1.18.3	Install a 0 to 5000 PSI (345 bar) pressure gauge at the manifold G port	Engage the enable and swing right switch. Check the pressure.	Above Min. Swing Right Pressure psi (bar) Below Min. Swing Right Pressure psi (bar)	Go to step 1.18.5 Go to step 1.18.4
1.18.4	Plumb a 0 to 5000 PSI (345 bar) pressure gauge into the manifold P port	Engage the enable and swing right switch. Check pressure at manifold P port	Above Min. Swing Right Pressure psi (bar) Below Min. Swing Right Pressure psi (bar)	Possible Causes: 4.1.38, 4.1.45, 4.1.74, 4.1.40, 4.1.10, 4.1.43 Possible Causes: 4.1.10, 4.1.46, 4.1.47, 4.1.74, 4.1.45, 4.1.39
1.18.5	Plumb a 0 to 5000 PSI (345 bar) pressure gauge into the hose from the swing motor cylinder	Check pressure at the swing motor while activating swing right at ground controls	Above Min. Swing Right Pressure psi (bar) Below Min. Swing Right Pressure psi (bar)	Possible Causes: 4.1.49, 4.1.48, 4.1.41 Possible Causes: 4.1.42, 4.1.52

1.19 PLATFORM LEVELING UP FUNCTION INOPERATIVE

Step	Pretest Instructions	Test	Result	Corrective Action
1.19.1		Basic check of likely causes		Possible Causes: 4.1.32, 4.1.33, 4.1.37
1.19.2	Engage enable and Level Up switch	DC - Is pump motor running? Gas - Is engine running at high idle	Yes No Yes No	Go to step 1.19.3 See 1.2 Pump Motor Will Not Operate - DC Powered Models Go to step 1.19.3 See 1.8 Engine High Idle Inoperative - Engine Models
1.19.3	Install a 0 to 5000 PSI (345 bar) pressure gauge at the manifold G port	Engage the enable and Level Up switch. Check the pressure.	Above Min. Level Up Pressure psi (bar) Below Min. Level Up Pressure psi (bar)	Go to step 1.19.5 Go to step 1.19.4
1.19.4	Plumb a 0 to 5000 PSI (345 bar) pressure gauge into the manifold P port	Engage the enable and Level Up switch. Check pressure at manifold P port	Above Min. Level Up Pressure psi (bar) Below Min. Level Up Pressure psi (bar)	Possible Causes: 4.1.38, 4.1.45, 4.1.74, 4.1.40, 4.1.10, 4.1.43 Possible Causes: 4.1.46, 4.1.47, 4.1.74, 4.1.45, 4.1.39, 4.1.10
1.19.5	Put boom in transport and activate Platform Level Down to relieve pressure. Some working pressure will still be in the line. Install a 0 to 5000 PSI (345 bar) pressure gauge at the manifold GA port	Engage the enable and Level Up switch. Check pressure at manifold GA port. Relieve the pressure before removing the gauge.	Above Min. Level Up Pressure psi (bar) Below Min. Level Up Pressure psi (bar)	Possible Causes: 4.1.49, 4.1.48, 4.1.41 Possible Causes: 4.1.42, 4.1.55, 4.1.44, 4.1.54

1.20 PLATFORM LEVELING DOWN FUNCTION INOPERATIVE

Step	Pretest Instructions	Test	Result	Corrective Action
1.20.1		Basic check of likely causes		Possible Causes: 4.1.32, 4.1.33, 4.1.37
1.20.2	Engage enable and Level Up switch	DC - Is pump motor running? Gas - Is engine running at high idle	Yes No Yes No	Go to step 1.20.3 See 1.2 Pump Motor Will Not Operate - DC Powered Models Go to step 1.20.3 See 1.8 Engine High Idle Inoperative - Engine Models
1.20.3	Install a 0 to 5000 PSI (345 bar) pressure gauge at the manifold G port	Engage the enable and Level Down switch. Check the pressure.	Above Min. Level Down Pressure psi (bar) Below Min. Level Down Pressure psi (bar)	Go to step 1.20.5 Go to step 1.20.4
1.20.4	Plumb a 0 to 5000 PSI (345 bar) pressure gauge into the manifold P port	Engage the enable and Level Down switch. Check pressure at manifold P port	Above Min. Level Down Pressure psi (bar) Below Min. Level Down Pressure psi (bar)	Possible Causes: 4.1.38, 4.1.45, 4.1.74, 4.1.40, 4.1.10, 4.1.43 Possible Causes: 4.1.46, 4.1.47, 4.1.74, 4.1.45, 4.1.39, 4.1.10
1.20.5	Put boom in transport and activate Platform Level Up to relieve pressure. Some working pressure will still be in the line. Install a 0 to 5000 PSI (345 bar) pressure gauge at the manifold GB port	Engage the enable and Level Down switch. Check pressure at manifold GB port. Relieve the pressure before removing the gauge.	Above Min. Level Down Pressure psi (bar) Below Min. Level Down Pressure psi (bar)	Possible Causes: 4.1.49, 4.1.48, 4.1.41 Possible Causes: 4.1.42, 4.1.57, 4.1.44, 4.1.56

SECTION 1 - TROUBLESHOOTING BY FUNCTION

1.21 JIB UP FUNCTION INOPERATIVE

Step	Pretest Instructions	Test	Result	Corrective Action
1.21.1		Basic check of likely causes		Possible Causes: 4.1.32, 4.1.33, 4.1.37
1.21.2	Engage enable and jib up switch	DC - Is pump motor running? Gas - Is engine running at high idle	Yes No Yes No	Go to step 1.21.3 See 1.2 Pump Motor Will Not Operate - DC Powered Models Go to step 1.21.3 See 1.8 Engine High Idle Inoperative - Engine Models
1.21.3	Install a 0 to 5000 PSI (345 bar) pressure gauge at the manifold G port	Engage the enable and jib up switch. Check the pressure.	Above Min. Jib Up Pressure psi (bar) Below Min. Jib Up Pressure psi (bar)	Go to step 1.21.5 Go to step 1.21.4
1.21.4	Plumb a 0 to 5000 PSI (345 bar) pressure gauge into the manifold P port	Engage the enable and jib up switch. Check pressure at manifold P port	Above Min. Jib Up Pressure psi (bar) Below Min. Jib Up Pressure psi (bar)	Possible Causes: 4.1.38, 4.1.45, 4.1.74, 4.1.40, 4.1.10, 4.1.43 Possible Causes: 4.1.46, 4.1.47, 4.1.74, 4.1.45, 4.1.39, 4.1.10
1.21.5	Plumb a 0 to 5000 PSI (345 bar) pressure gauge into the hose from the jib cylinder cap end.	Check pressure at the jib cylinder while activating jib up at ground controls	Above Min. Jib Up Pressure psi (bar) Below Min. Jib Up Pressure psi (bar)	Possible Causes: 4.1.49, 4.1.48, 4.1.41 Possible Causes: 4.1.42, 4.1.60

1.22 JIB DOWN FUNCTION INOPERATIVE

Step	Pretest Instructions	Test	Result	Corrective Action
1.22.1		Basic check of likely causes		Possible Causes: 4.1.33, 4.1.37, 4.1.49
1.22.2		Does Manual Descent lower the jib?	Yes No	Possible Causes: 4.1.38, 4.1.61, 4.1.48, 4.1.10 Possible Causes: 4.1.41, 4.1.47, 4.1.10

1.23 OUTRIGGER SET FUNCTION INOPERATIVE

See 1.12 Ground Leveling Not Functioning Properly

1.24 OUTRIGGER STOW FUNCTION INOPERATIVE

See 1.12 Ground Leveling Not Functioning Properly

SECTION 2. TROUBLESHOOTING BY FAULT MESSAGES

2.1 ACCESSORY FAULT

Distress Lamp: 9 ADE Code: 6-7

An attached accessory is communicating a fault to the ground control.

Step	Pretest Instructions	Test	Result	Corrective Action
2.1.1		Is an accessory installed?	Yes	Refer to Information Supplied with Accessory
			No	Possible Causes: 4.1.2

2.2 BATTERY VOLTAGE TOO HIGH - SYSTEM SHUTDOWN

Distress Lamp: 3 ADE Code: 4-4

The system detected a battery voltage above 36 Volts for an electric powered machine.

ELECTRIC POWERED MACHINES ONLY

Functions Disabled (Electric Powered Machines Only): Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R), Drive

Possible Causes: 4.1.2, 4.1.3, 4.1.4

2.3 BATTERY VOLTAGE TOO HIGH - SYSTEM SHUTDOWN

Distress Lamp: 5 ADE Code: 4-4

The system detected a battery voltage above 18 Volts for an engine powered machine.

ENGINE POWERED MACHINES ONLY

Functions Disabled (Engine Powered Machines Only): Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R), Engine Start, Engine Throttle Pull, Engine Throttle Hold, Engine Choke Pull, Engine Choke Hold, Drive

Possible Causes: 4.1.2, 4.1.3, 4.1.4

2.4 BATTERY VOLTAGE TOO LOW - SYSTEM SHUTDOWN

Distress Lamp: 3 ADE Code: 4-4

The system detected a battery voltage below 16 Volts for an electric powered machine.

ELECTRIC POWERED MACHINES ONLY

Functions Disabled (Electric Powered Machines Only): Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R), Drive

Possible Causes: 4.1.2, 4.1.3, 4.1.4

2.5 BATTERY VOLTAGE TOO LOW - SYSTEM SHUTDOWN

Distress Lamp: 5

ADE Code: 4-4

The system detected a battery voltage below 9 Volts for an engine powered machine.

ENGINE POWERED MACHINES ONLY

Functions Disabled (Engine Powered Machines Only): Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R), Engine Start, Engine Throttle Pull, Engine Throttle Hold, Engine Choke Pull, Engine Choke Hold, Drive

Possible Causes: 4.1.2, 4.1.3, 4.1.4

2.6 CANBUS FAILURE - ACCESSORY MODULE COMMUNICATIONS LOST

Distress Lamp: 9

ADE Code: 6-6

System cannot communicate with an installed accessory

Step	Pretest Instructions	Test	Result	Corrective Action
2.6.1		Is an accessory installed?	Yes	Refer to Information Supplied with Accessory
			No	Possible Causes: 4.1.2

2.7 CANBUS FAILURE - DRIVE MODULE

Distress Lamp: 9

ADE Code: 6-6

System cannot communicate with the drive module.

DRIVE OPTION MACHINES ONLY

Functions Disabled (Machines With Drive Option Only): Drive

Step	Pretest Instructions	Test	Result	Corrective Action
2.7.1		Basic check of likely causes		Possible Causes: 4.1.2 Go to step 2.7.2
2.7.2	Pull the ground emergency stop switch and place key switch in ground position	Voltage between X074.1 and X074.2 = Vbatt?	Yes No	Go to step 2.7.3 See 3.4 Drive Module - Power
2.7.3	Make sure that machine is powered off and drive module is properly connected	Measured RESISTANCE between X012.3 Red wire and X012.4 Black = 60Ω?	Yes No	Go to step 2.7.7 Go to step 2.7.4
2.7.4	Disconnect drive module at X075	Measured RESISTANCE between X075.9.soc and X075.10.soc = 60Ω?	Yes No	Possible Causes: 4.1.9 Go to step 2.7.5
2.7.5	Disconnect drive module at X057	Measured RESISTANCE between X057.A.pin and X057.C.pin = 60Ω?	Yes No	Possible Causes: 4.1.9, 4.1.10, 4.1.13 Go to step 2.7.6
2.7.6	Disconnect X054	Measured RESISTANCE between X054.1.soc and X054.3.soc = 120Ω?	Yes No	Electric Machine - Go to Step 2.7.9 Engine Machine - Go to Step 2.7.10 Repair platform CAN termination resistor at X057
2.7.7	Make sure that machine is powered off and drive module is properly connected	Test for continuity between X075.9 and X007.13	Yes No	Go to step 2.7.8 Repair red wire between X075.9 and X007.13
2.7.8	Make sure that machine is powered off and drive module is properly connected	Test for continuity between X075.10 and X007.24	Yes No	Possible Causes: 4.1.9, 4.1.10, 4.1.13 Repair black wire between X075.10 and X007.24
2.7.9	Disconnect Power Module at X010	Measured power module CAN resistance between X010.10.pin and X010.11.pin = 120Ω?	Yes No	Possible Causes: 4.1.10 Possible Causes: 4.1.12
2.7.10	Disconnect Ground Module at X007	Measured ground module CAN resistance between X007.13.pin and X007.24.pin = 120Ω?	Yes No	Possible Causes: 4.1.10 Go to step 2.7.11
2.7.11	Disconnect X007	Test harness for continuity between X007.6.soc and X007.17.soc	Yes No	Possible Causes: 4.1.10 Repair or replace black jumper wire between X007.6.soc and X007.17.soc

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.8 CANBUS FAILURE - PLATFORM MODULE

Distress Lamp: 9

ADE Code: 6-6

System cannot communicate with the platform module.

Functions Disabled at Platform Only: Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R), Engine Start, Engine Throttle Pull, Engine Throttle Hold, Engine Choke Pull, Engine Choke Hold

Step	Pretest Instructions	Test	Result	Corrective Action
2.8.1	Pull the ground emergency stop switch and place key switch in the platform position	Do the platform lights blink when the platform emergency stop switch is pulled?	Yes No	Go to step 2.8.2 See 3.13 Platform Module - Power
2.8.2	Make sure that machine is powered off and platform module is properly connected	Measured RESISTANCE between X060.3 Red wire and X060.4 Black = 60Ω?	Yes No	Go to step 2.8.5 Go to step 2.8.3
2.8.3	Disconnect X054	Measured RESISTANCE between X054.1.soc and X054.3.soc = 120Ω?	Yes No	Electric Machine - Go to Step 2.8.7 Engine Machine - Go to Step 2.8.9 Go to step 2.8.4
2.8.4	Disconnect X054 and X057	Measured RESISTANCE between X057.A.pin and X057.C.pin = 120Ω?	Yes No	Possible Causes: 4.1.11 Repair platform CAN termination resistor at X057
2.8.5		Test for continuity between X060.3 and X007.13	Yes No	Go to step 2.8.6 Repair red wire between X060.3 and X007.13
2.8.6		Test for continuity between X060.4 and X007.24	Yes No	Possible Causes: 4.1.11, 4.1.10, 4.1.13 Repair black wire between X060.4 and X007.24
2.8.7	Disconnect Power Module at X010	Measured power module CAN resistance between X010.10.pin and X010.11.pin = 120Ω?	Yes No	Go to step 2.8.8 Possible Causes: 4.1.12
2.8.8	Disconnect Ground Module at X007	Measured ground module CAN resistance between X007.13.soc and X007.24.soc = 60Ω?	Yes No	Possible Causes: 4.1.11 Repair CAN wiring between X010 and X054
2.8.9	Disconnect Ground Module at X007	Measured ground module CAN resistance between X007.13.pin and X007.24.pin = 120Ω?	Yes No	Possible Causes: 4.1.14, 4.1.11 Go to step 2.8.10
2.8.10	Disconnect X007	Test harness for continuity between X007.6.soc and X007.17.soc	Yes No	Possible Causes: 4.1.10 Repair or replace black jumper wire between X007.6.soc and X007.17.soc

2.9 CANBUS FAILURE - POWER MODULE

Distress Lamp: 9

ADE Code: 6-6

System cannot communicate with the electric power control module.

ELECTRIC POWERED MACHINES ONLY

Functions Disabled: Lift Up, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.9.1	Pull the ground emergency stop switch and place key switch in the ground position	Does the power module LED light solidly when the ground emergency stop switch is pulled?	Yes No	Go to step 2.9.2 See 3.14 Power Module - Power
2.9.2	Make sure that machine is powered off and power module is properly connected	Measured RESISTANCE between X010.10 Red wire and X010.11 Black = 60Ω ?	Yes No	Go to step 2.9.5 Go to step 2.9.3
2.9.3	Disconnect X010	Measured RESISTANCE between X010.10.pin and X010.11.pin = 120Ω ?	Yes No	Go to Step 2.9.4 Possible Causes: 4.1.12
2.9.4	Disconnect X054	Measured RESISTANCE between X054.1.soc and X054.3.soc = 120Ω ?	Yes No	Go to Step 2.9.7 Repair platform CAN termination resistor at X057
2.9.5		Test for continuity between X010.10 and X007.13	Yes No	Go to step 2.9.6 Repair red wire between X010.10 and X007.13
2.9.6		Test for continuity between X010.11 and X007.24	Yes No	Possible Causes: 4.1.12, 4.1.10, 4.1.13 Repair black wire between X010.11 and X007.24
2.9.7	Disconnect Ground Module at X007	Measured ground module CAN resistance between X007.13.soc and X007.24.soc = 60Ω ?	Yes No	Possible Causes: 4.1.12, 4.1.10, 4.1.13 Repair CAN wiring between X010 and X054

2.10 CHASSIS TILT SENSOR GAIN NOT CALIBRATED

Distress Lamp: 9

ADE Code: 9-9

Indicates that the chassis tilt sensor calibration information has become corrupted. Vehicle will indicate that it is tilted at all times. This calibration data is programmed at the factory.

Functions Disabled: Same as Tilted

Possible Causes: 4.1.10

2.11 CHASSIS TILT SENSOR GAIN OUT OF RANGE

Distress Lamp: 9

ADE Code: 9-9

Indicates that the chassis tilt sensor calibration information has become corrupted. Vehicle will indicate that it is tilted at all times. This calibration data is programmed at the factory.

Functions Disabled: Same as Tilted

Possible Causes: 4.1.10

2.12 CHASSIS TILT SENSOR NOT CALIBRATED

Distress Lamp: 9

ADE Code: 8-1

The tilt sensor calibration has not been performed for the chassis tilt sensor. Tilt reading displayed as 90° and vehicle assumed to be tilted.

Functions Disabled: Same as Tilted

Step	Pretest Instructions	Test	Result	Corrective Action
2.12.1		Has the tilt sensor calibration been run?	Yes No	Possible Causes: 4.1.10 Run the tilt sensor calibration

2.13 CHASSIS TILT SENSOR OUT OF RANGE

Distress Lamp: None

ADE Code: None

Tilt Sensor read angle greater than 19° for more than 4 seconds after 2 second power-up delay. Tilt reading displayed as 90° and vehicle assumed to be tilted.

Functions Disabled: Same as Tilted

Step	Pretest Instructions	Test	Result	Corrective Action
2.13.1		Is the machine tilted 19° or more?	Yes No	Level machine before operating Go to step 2.13.2
2.13.2		Is the ground module properly oriented and mounted?	Yes No	Go to step 2.13.3 Properly secure the ground module with the machine resting on a level surface. Run the tilt sensor calibration
2.13.3		Has a tilt sensor calibration been run recently?	Yes No	Possible Causes: 4.1.10 Properly secure the ground module with the machine resting on a level surface. Run the tilt sensor calibration

2.14 CHOKE HOLD SOLENOID OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Engine Choke Hold digital output may be disconnected from solenoid or the solenoid may be defective.

ENGINE POWERED MACHINES ONLY

Functions Disabled (Engine Powered Machines Only): Engine Choke Hold

Step	Pretest Instructions	Test	Result	Corrective Action
2.14.1	Run system test	Do other functions fail system test?	Yes No	Check: 4.1.15, 4.1.1, otherwise go to step 2.14.2 Go to step 2.14.2
2.14.2	Disconnect solenoid at X098. On harness end, short X098 WHT/YEL 48-5 to X098 BLACK wire	Rerun System Test	Analyzer Message "CHOKE HOLD SOLENOID SHORT TO GROUND" Analyzer Message "CHOKE HOLD SOLENOID OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.14.3
2.14.3	Replace X003.7 with a jumper to X003.3	Rerun System Test	Analyzer Message "CHOKE HOLD SOLENOID SHORT TO GROUND" Analyzer Message "CHOKE HOLD SOLENOID OPEN CIRCUIT"	Wire WHT/YEL 48-5 broken. Repair or replace Possible Cause: 4.1.10

2.15 CHOKE HOLD SOLENOID SHORT TO BATTERY

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Engine Choke Hold digital output may be shorted to battery or other function.

ENGINE POWERED MACHINES ONLY

Functions Disabled (Engine Powered Machines Only): Engine Choke Hold

Step	Pretest Instructions	Test	Result	Corrective Action
2.15.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: 4.1.15, 4.1.1, otherwise go to step 2.15.2 Go to step 2.15.2
2.15.2	Disconnect solenoid at X098 and isolate wires	Rerun System Test	Analyzer Message "CHOKE HOLD SOLENOID OPEN CIRCUIT" Analyzer Message "CHOKE HOLD SOLENOID SHORT TO BATTERY"	Replace solenoid Go to step 2.15.3
2.15.3	Remove wire WHT/YEL 48-5 from X003.7	Rerun System Test	Analyzer Message "CHOKE HOLD SOLENOID OPEN CIRCUIT" Analyzer Message "CHOKE HOLD SOLENOID SHORT TO BATTERY"	Wire WHT/YEL 48-5 shorted to battery. Repair or replace Possible Cause: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.16 CHOKE HOLD SOLENOID SHORT TO GROUND

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Engine Choke Hold digital output may be shorted to ground or solenoid may be defective

ENGINE POWERED MACHINES ONLY

Functions Disabled (Engine Powered Machines Only): Engine Choke Hold

Step	Pretest Instructions	Test	Result	Corrective Action
2.16.1	Disconnect solenoid at X098 and isolate wires	Rerun System Test	Analyzer Message "CHOKE HOLD SOLENOID OPEN CIRCUIT" Analyzer Message "CHOKE HOLD SOLENOID SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.16.2
2.16.2	Remove wire WHT/YEL 48-5 from X003.7	Rerun System Test	Analyzer Message "CHOKE HOLD SOLENOID OPEN CIRCUIT" Analyzer Message "CHOKE HOLD SOLENOID SHORT TO GROUND"	Wire WHT/YEL 48-5 shorted to ground. Repair or replace Possible Cause: 4.1.10

2.17 CHOKE PULL RELAY OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Engine Choke Pull digital output may be disconnected from the relay or the relay may be defective.

ENGINE POWERED MACHINES ONLY

Functions Disabled (Engine Powered Machines Only): Engine Choke Pull

Step	Pretest Instructions	Test	Result	Corrective Action
2.17.1	Run system test	Do other functions fail system test?	Yes No	Check: 4.1.15, 4.1.1, otherwise go to step 2.17.2 Go to step 2.17.2
2.17.2	Disconnect relay at X093. At harness end, short X093.86 WHT/YEL 48-4 to X093.85 BLACK wire	Rerun System Test	Analyzer Message "CHOKE PULL RELAY SHORT TO GROUND" Analyzer Message "CHOKE PULL RELAY OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.17.3
2.17.3	Replace X003.4 with a jumper to X003.3	Rerun System Test	Analyzer Message "CHOKE PULL RELAY SHORT TO GROUND" Analyzer Message "CHOKE PULL RELAY OPEN CIRCUIT"	Wire WHT/YEL 48-4 broken. Repair or replace Possible Cause: 4.1.10

2.18 CHOKE PULL RELAY SHORT TO BATTERY

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Engine Choke Pull digital output may be shorted to battery or other function.

ENGINE POWERED MACHINES ONLY

Functions Disabled (Engine Powered Machines Only): Engine Choke Pull

Step	Pretest Instructions	Test	Result	Corrective Action
2.18.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: 4.1.15, 4.1.1, otherwise go to step 2.18.2 Go to step 2.18.2
2.18.2	Disconnect relay at X093 and isolate wires	Rerun System Test	Analyzer Message "CHOKE PULL RELAY OPEN CIRCUIT" Analyzer Message "CHOKE PULL RELAY SHORT TO BATTERY"	Replace solenoid Go to step 2.18.3
2.18.3	Remove wire WHT/YEL 48-4 from X003.4	Rerun System Test	Analyzer Message "CHOKE PULL RELAY OPEN CIRCUIT" Analyzer Message "CHOKE PULL RELAY SHORT TO BATTERY"	Wire WHT/YEL 48-4 shorted to battery. Repair or replace Possible Cause: 4.1.10

2.19 CHOKE PULL RELAY SHORT TO GROUND

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Engine Choke Pull digital output may be shorted to ground or the relay may be defective.

ENGINE POWERED MACHINES ONLY

Functions Disabled (Engine Powered Machines Only): Engine Choke Pull

Step	Pretest Instructions	Test	Result	Corrective Action
2.19.1	Disconnect solenoid at X093 and isolate wires	Rerun System Test	Analyzer Message "CHOKE PULL RELAY OPEN CIRCUIT" Analyzer Message "CHOKE PULL RELAY SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.19.2
2.19.2	Remove wire WHT/YEL 48-4 from X003.4	Rerun System Test	Analyzer Message "CHOKE PULL RELAY OPEN CIRCUIT" Analyzer Message "CHOKE PULL RELAY SHORT TO GROUND"	Wire WHT/YEL 48-4 shorted to ground. Repair or replace Possible Cause: 4.1.10

2.20 DRIVE & O/R PREVENTED - OPERATE FROM PLATFORM

Distress Lamp: 2

ADE Code: 2-5

In Platform Mode, an attempt was made to operate Drive or Outriggers, but X007.7 is not at Battery Voltage, as it should be when the platform console is plugged into the platform position.

Using the JLG Analyzer, view the Platform Position status under DIAGNOSTICS -> SYSTEM. The vehicle must be in "AWP MODE" (not "HOOK MODE") with PLTPOS1 +B and PLTPOS2 GND.

DRIVE OPTION MACHINES ONLY

Functions Disabled (Drive Option Machines Only): Drive

Step	Pretest Instructions	Test	Result	Corrective Action
2.20.1		Is the platform console plugged into the platform?	Yes No	Go to step 2.20.2 Connect the platform console at the platform position and try again
2.20.2	Using the JLG Analyzer, view the Platform Position status under DIAGNOSTICS -> SYSTEM. The vehicle must be in "AWP MODE" (not "HOOK MODE") with PLTPOS1 +B and PLTPOS2 GND.	Is PLTPOS1 +B?	Yes No	Possible Cause: 4.1.10 Go to step 2.20.3
2.20.3	With the console in the platform position, pull the ground and platform emergency stop switches and place key switch in the platform position	Is the voltage on X059.D.pin = VBatt?	Yes No	Go to step 2.20.4 Possible Cause:
2.20.4	With the console in the platform position, pull the ground and platform emergency stop switches and place key switch in the platform position	Is the voltage on X059.K = VBatt?	Yes No	Go to step 2.20.5 See 2.124 Platform Position Detection Faulty
2.20.5	Remove X058.K. With the console in the platform position, pull the ground and platform emergency stop switches and place key switch in the platform position	Is the voltage on X058.K.soc = VBatt?	Yes No	Go to step 2.20.6 See 2.124 Platform Position Detection Faulty
2.20.6	Remove X054.10. With the console in the platform position, pull the ground and platform emergency stop switches and place key switch in the platform position	Is the voltage on X054.10.soc = VBatt?	Yes No	Go to step 2.20.7 See 2.124 Platform Position Detection Faulty
2.20.7	Remove X019.10. With the console in the platform position, pull the ground and platform emergency stop switches and place key switch in the platform position	Is the voltage on X019.10.pin = VBatt?	Yes No	Possible Cause: Orn/Red 49-10 wire open or swapped with Orn/Red 49-9 wire. See 2.124 Platform Position Detection Faulty Possible Cause: Orn/Blk boom wire open or swapped with Blu/Blk wire. See 2.124 Platform Position Detection Faulty

2.21 DRIVE & O/R PREVENTED - PLACE BOOM ON REST

Distress Lamp: 2 ADE Code: 2-5

In Platform Mode, an attempt was made to operate Drive or Outriggers but the Boom was not detected by the Turntable position sensor at X073, or an error was detected with the sensor. When the boom is against the rest, TURNTABLE1 input, X074.3 = +B and TURNTABLE2 input, X074.4 = 0V. This could be caused by the boom not being properly stowed on the rest, an obstruction over the switch, the switch adjusted too far from the boom (should be within 0.188" of the boom), or a faulty transport limit switch or turntable position switch. If an error has been detected, the switch must be reset before drive will function.

DRIVE OPTION MACHINES ONLY

Functions Disabled (Drive Option Machines Only): Drive

See 3.5 Drive Sensor Reset

2.22 DRIVE & O/R PREVENTED - SET HAND BRAKE

Distress Lamp: 2 ADE Code: 2-5

In Platform Mode, an attempt was made to operate Drive or Outriggers but the Hand Brake was not detected by the hand brake position sensor at X072 as set (applied) or an error was detected with the sensor. If the hand brake appears to be in the proper position, examine the Hand Brake Sensor wiring and adjustment. When the hand brake is applied, BRAKE1 input, X074.5 = +B and BRAKE2 input, X074.6 = 0V. This could be caused by the brake linkage or cable not being properly adjusted, an obstruction over the switch, the switch adjusted too far from the cylinder (should be within 0.188" of the extended cylinder), or a faulty switch. If an error has been detected, the switch must be reset before drive will function.

DRIVE OPTION MACHINES ONLY

Functions Disabled (Drive Option Machines Only): Drive

See 3.5 Drive Sensor Reset

2.23 DRIVE ENABLE SOLENOID SHORT TO BATTERY

Distress Lamp: 9 ADE Code: 3-3

Drive module feedback shows that the Drive Enable Valve PWM output may be shorted to battery or the solenoid may be defective

DRIVE OPTION MACHINES ONLY

Functions Disabled (Drive Option Machines Only): Drive

Step	Pretest Instructions	Test	Result	Corrective Action
2.23.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.23.2 Go to step 2.23.2
2.23.2	Disconnect solenoid at X071 and isolate wires	Rerun System Test	Analyzer Message "DRVENABLE SHORT TO GROUND OR OPEN CIRCUIT" Analyzer Message "DRVENABLE VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.23.3
2.23.3	Remove wire Orn 55-1 from X074.11	Rerun System Test	Analyzer Message "DRVENABLE SHORT TO GROUND OR OPEN CIRCUIT" Analyzer Message "DRVENABLE VALVE SHORT TO BATTERY"	Wire Orn 55-1 shorted to battery. Repair or replace Possible Cause: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.24 DRIVE ENABLE SOLENOID SHORT TO GROUND OR OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Drive module feedback shows that the Drive Enable Valve PWM output may be disconnected, shorted to ground, or the solenoid may be defective.

DRIVE OPTION MACHINES ONLY

Step	Pretest Instructions	Test	Result	Corrective Action
2.24.1	Disconnect solenoid at X071 and measure resistance	Is the solenoid resistance 7.2 Ohms?	Yes No	Go to step 2.24.2 Repair/Replace solenoid
2.24.2	Remove wire Orn 55-1 from X074.11	Is X074.11.soc shorted or open to X074.2.soc?	Yes - Open Yes-Short to Ground No	Possible Causes: Open in Orn 55-1 or Black or Red/Blk boom wire. Repair or replace Possible Causes: Wire Orn 55-1 shorted to ground. Repair or replace Possible Cause: 4.1.1, 4.1.10

2.25 DRIVE LEFT FORWARD SOLENOID OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Drive module feedback shows that the Drive Left Forward Valve PWM output may be disconnected or the solenoid may be defective.

DRIVE OPTION MACHINES ONLY

Functions Disabled (Drive Option Machines Only): Drive Left Forward

Step	Pretest Instructions	Test	Result	Corrective Action
2.25.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise Go to step 2.25.2 Go to step 2.25.2
2.25.2	Short X067.1.soc to X067.2.soc	Rerun System Test	Analyzer Message "DRV LEFT FWD VALVE SHORT TO GROUND" Analyzer Message "DRV LEFT FWD VALVE OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.25.3
2.25.3	Replace X074.7 with a jumper to X074.2	Rerun System Test	Analyzer Message "DRV LEFT FWD VALVE SHORT TO GROUND" Analyzer Message "DRV LEFT FWD VALVE OPEN CIRCUIT"	Wire Orn 7-4 broken. Repair or replace Possible Cause: 4.1.10

2.26 DRIVE LEFT FORWARD SOLENOID SHORT TO BATTERY

Distress Lamp: 9

ADE Code: 3-3

Drive module feedback shows that the Drive Left Forward Valve PWM output may be shorted to battery or the solenoid may be defective

DRIVE OPTION MACHINES ONLY

Functions Disabled (Drive Option Machines Only): Drive Left Forward

Step	Pretest Instructions	Test	Result	Corrective Action
2.26.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.26.2 Go to step 2.26.2
2.26.2	Disconnect solenoid at X074 and isolate wires	Rerun System Test	Analyzer Message "DRV LEFT FWD VALVE OPEN CIRCUIT" Analyzer Message "DRV LEFT FWD VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.26.3
2.26.3	Remove wire Orn 7-4 from X074.7	Rerun System Test	Analyzer Message "DRV LEFT FWD VALVE OPEN CIRCUIT" Analyzer Message "DRV LEFT FWD VALVE SHORT TO BATTERY"	Wire Orn 7-4 shorted to battery. Repair or replace Possible Cause: 4.1.10

2.27 DRIVE LEFT FORWARD SOLENOID SHORT TO GROUND

Distress Lamp: 9

ADE Code: 3-3

Drive module feedback shows that the drive left forward digital output may be shorted to ground or the relay may be defective.

DRIVE OPTION MACHINES ONLY

Functions Disabled (Drive Option Machines Only): Drive Left Forward

Step	Pretest Instructions	Test	Result	Corrective Action
2.27.1	Disconnect solenoid at X074 and isolate wires	Rerun System Test	Analyzer Message "DRV LEFT FWD VALVE OPEN CIRCUIT" Analyzer Message "DRV LEFT FWD VALVE SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.27.2
2.27.2	Remove wire Orn 7-4 from X074.7	Rerun System Test	Analyzer Message "DRV LEFT FWD VALVE OPEN CIRCUIT" Analyzer Message "DRV LEFT FWD VALVE SHORT TO GROUND"	Wire Orn 7-4 shorted to ground. Repair or replace Possible Cause: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.28 DRIVE LEFT REVERSE SOLENOID OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Drive module feedback shows that the Drive Left Reverse Valve PWM output may be disconnected or the solenoid may be defective.

DRIVE OPTION MACHINES ONLY

Functions Disabled (Drive Option Machines Only): Drive Left Reverse

Step	Pretest Instructions	Test	Result	Corrective Action
2.28.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise Go to step 2.28.2 Go to step 2.28.2
2.28.2	Short X069.1.soc to X069.2.soc	Rerun System Test	Analyzer Message "DRV LEFT REV VALVE SHORT TO GROUND" Analyzer Message "DRV LEFT REV VALVE OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.28.3
2.28.3	Replace X074.8 with a jumper to X074.2	Rerun System Test	Analyzer Message "DRV LEFT REV VALVE SHORT TO GROUND" Analyzer Message "DRV LEFT REV VALVE OPEN CIRCUIT"	Orn 8-4 wire broken. Repair or replace Possible Cause: 4.1.10

2.29 DRIVE LEFT REVERSE SOLENOID SHORT TO BATTERY

Distress Lamp: 9

ADE Code: 3-3

Drive module feedback shows that the Drive Left Reverse Valve PWM output may be shorted to battery or the solenoid may be defective

DRIVE OPTION MACHINES ONLY

Functions Disabled (Drive Option Machines Only): Drive Left Reverse

Step	Pretest Instructions	Test	Result	Corrective Action
2.29.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.29.2 Go to step 2.29.2
2.29.2	Disconnect solenoid at X069 and isolate wires	Rerun System Test	Analyzer Message "DRV LEFT REV VALVE OPEN CIRCUIT" Analyzer Message "DRV LEFT REV VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.29.3
2.29.3	Remove wire Orn 8-4 from X074.8	Rerun System Test	Analyzer Message "DRV LEFT REV VALVE OPEN CIRCUIT" Analyzer Message "DRV LEFT REV VALVE SHORT TO BATTERY"	Wire Orn 8-4 shorted to battery. Repair or replace Possible Cause: 4.1.10

2.30 DRIVE LEFT REVERSE SOLENOID SHORT TO GROUND

Distress Lamp: 9 ADE Code: 3-3

Drive module feedback shows that the drive left reverse digital output may be shorted to ground or the relay may be defective.

DRIVE OPTION MACHINES ONLY

Functions Disabled (Drive Option Machines Only): Drive Left Reverse

Step	Pretest Instructions	Test	Result	Corrective Action
2.30.1	Disconnect solenoid at X069 and isolate wires	Rerun System Test	Analyzer Message "DRV LEFT REV VALVE OPEN CIRCUIT" Analyzer Message "DRV LEFT REV VALVE SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.30.2
2.30.2	Remove wire Orn 8-4 from X074.8	Rerun System Test	Analyzer Message "DRV LEFT REV VALVE OPEN CIRCUIT" Analyzer Message "DRV LEFT REV VALVE SHORT TO GROUND"	Wire Orn 8-4 shorted to ground. Repair or replace Possible Cause: 4.1.10

2.31 DRIVE PREVENTED - LIFT DOWN

Distress Lamp: 2 ADE Code: 2-5

In Platform Mode, an attempt was made to operate Drive or Outriggers but the Boom was not detected to be stowed by the Transport limit switch at X040. When the boom is stowed in transport position, TRANS LMT SW input, X004.11 = +B.

DRIVE OPTION MACHINES ONLY

Functions Disabled (Drive Option Machines Only): Drive

See 3.17 Transport Limit Switch

2.32 DRIVE PREVENTED - STOW OUTRIGGERS

Distress Lamp: 2 ADE Code: 2-5

In Platform Mode, an attempt was made to operate Drive but at least one outrigger was detected to be set. All outriggers must be unset before drive will function. Outrigger status can be viewed on the ground control panel LEDs or with the Analyzer in Diagnostics -> Ground

DRIVE OPTION MACHINES ONLY

Functions Disabled (Drive Option Machines Only): Drive

Stow all outriggers. If message is still present, See 3.12 Outrigger Switches - All Stowed

2.33 DRIVE PREVENTED - TELESCOPE IN

Distress Lamp: 2 ADE Code: 2-5

In Platform Mode, an attempt was made to operate Drive but the boom was not detected to be telescoped in by the Telescope limit switch at X041. When the boom is stowed in transport position, TELE LMT SW input, X004.21 = +B.

DRIVE OPTION MACHINES ONLY

Functions Disabled (Drive Option Machines Only): Drive

See 3.15 Telescope Limit Switch

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.34 DRIVE RIGHT FORWARD SOLENOID OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Drive module feedback shows that the Drive Right Forward Valve PWM output may be disconnected or the solenoid may be defective.

DRIVE OPTION MACHINES ONLY

Functions Disabled (Drive Option Machines Only): Drive Right Forward

Step	Pretest Instructions	Test	Result	Corrective Action
2.34.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise Go to step 2.34.2 Go to step 2.34.2
2.34.2	Short X068.1.soc to X068.2.soc	Rerun System Test	Analyzer Message "DRV RIGHT FWD VALVE SHORT TO GROUND" Analyzer Message "DRV RIGHT FWD VALVE OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.34.3
2.34.3	Replace X074.9 with a jumper to X074.2	Rerun System Test	Analyzer Message "DRV RIGHT FWD VALVE SHORT TO GROUND" Analyzer Message "DRV RIGHT FWD VALVE OPEN CIRCUIT"	Wire Orn 7-2 broken. Repair or replace Possible Cause: 4.1.10

2.35 DRIVE RIGHT FORWARD SOLENOID SHORT TO BATTERY

Distress Lamp: 9

ADE Code: 3-3

Drive module feedback shows that the Drive Right Forward Valve PWM output may be shorted to battery or the solenoid may be defective

DRIVE OPTION MACHINES ONLY

Functions Disabled (Drive Option Machines Only): Drive Right Forward

Step	Pretest Instructions	Test	Result	Corrective Action
2.35.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.41.2 Go to step 2.35.2
2.35.2	Disconnect solenoid at X068 and isolate wires	Rerun System Test	Analyzer Message "DRV RIGHT FWD VALVE OPEN CIRCUIT" Analyzer Message "DRV RIGHT FWD VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.35.3
2.35.3	Remove wire Orn 7-2 from X002.9	Rerun System Test	Analyzer Message "DRV RIGHT FWD VALVE OPEN CIRCUIT" Analyzer Message "DRV RIGHT FWD VALVE SHORT TO BATTERY"	Wire Orn 7-2 shorted to battery. Repair or replace Possible Cause: 4.1.10

2.36 DRIVE RIGHT FORWARD SOLENOID SHORT TO GROUND

Distress Lamp: 9 ADE Code: 3-3

Drive module feedback shows that the drive right forward digital output may be shorted to ground or the relay may be defective.

DRIVE OPTION MACHINES ONLY

Functions Disabled (Drive Option Machines Only): Drive Right Forward

Step	Pretest Instructions	Test	Result	Corrective Action
2.36.1	Disconnect solenoid at X068 and isolate wires	Rerun System Test	Analyzer Message "DRV RIGHT FWD VALVE OPEN CIRCUIT" Analyzer Message "DRV RIGHT FWD VALVE SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.36.2
2.36.2	Remove wire WHT/YEL 48-4 from X074.9	Rerun System Test	Analyzer Message "DRV RIGHT FWD VALVE OPEN CIRCUIT" Analyzer Message "DRV RIGHT FWD VALVE SHORT TO GROUND"	Wire WHT/YEL 48-4 shorted to ground. Repair or replace Possible Cause: 4.1.10

2.37 DRIVE RIGHT REVERSE SOLENOID OPEN CIRCUIT

Distress Lamp: 9 ADE Code: 3-3

Drive module feedback shows that the Drive Right Reverse Valve PWM output may be disconnected or the solenoid may be defective.

DRIVE OPTION MACHINES ONLY

Functions Disabled (Drive Option Machines Only): Drive Right Reverse

Step	Pretest Instructions	Test	Result	Corrective Action
2.37.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise Go to step 2.37.2 Go to step 2.37.2
2.37.2	Short X070.1.soc to X070.2.soc	Rerun System Test	Analyzer Message "DRV RIGHT REV VALVE SHORT TO GROUND" Analyzer Message "DRV RIGHT REV VALVE OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.37.3
2.37.3	Replace X074.10 with a jumper to X074.2	Rerun System Test	Analyzer Message "DRV RIGHT REV VALVE SHORT TO GROUND" Analyzer Message "DRV RIGHT REV VALVE OPEN CIRCUIT"	Wire Orn 8-2 broken. Repair or replace Possible Cause: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.38 DRIVE RIGHT REVERSE SOLENOID SHORT TO BATTERY

Distress Lamp: 9

ADE Code: 3-3

Drive module feedback shows that the Drive Right Reverse Valve PWM output may be shorted to battery or the solenoid may be defective

DRIVE OPTION MACHINES ONLY

Functions Disabled (Drive Option Machines Only): Drive Right Reverse

Step	Pretest Instructions	Test	Result	Corrective Action
2.38.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.38.2 Go to step 2.38.2
2.38.2	Disconnect solenoid at X070 and isolate wires	Rerun System Test	Analyzer Message "DRV RIGHT REV VALVE OPEN CIRCUIT" Analyzer Message "DRV RIGHT REV VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.38.3
2.38.3	Remove wire Orn 8-2 from X074.10	Rerun System Test	Analyzer Message "DRV RIGHT REV VALVE OPEN CIRCUIT" Analyzer Message "DRV RIGHT REV VALVE SHORT TO BATTERY"	Wire Orn 8-2 shorted to battery. Repair or replace Possible Cause: 4.1.10

2.39 DRIVE RIGHT REVERSE SOLENOID SHORT TO GROUND

Distress Lamp: 9

ADE Code: 3-3

Drive module feedback shows that the drive right reverse digital output may be shorted to ground or the relay may be defective.

DRIVE OPTION MACHINES ONLY

Functions Disabled (Drive Option Machines Only): Drive Right Reverse

Step	Pretest Instructions	Test	Result	Corrective Action
2.39.1	Disconnect solenoid at X070 and isolate wires	Rerun System Test	Analyzer Message "DRV RIGHT REV VALVE OPEN CIRCUIT" Analyzer Message "DRV RIGHT REV VALVE SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.19.2
2.39.2	Remove wire Orn 8-2 from X074.10	Rerun System Test	Analyzer Message "DRV RIGHT REV VALVE OPEN CIRCUIT" Analyzer Message "DRV RIGHT REV VALVE SHORT TO GROUND"	Wire Orn 8-2 shorted to ground. Repair or replace Possible Cause: 4.1.10

2.40 DUMP SOLENOID OPEN CIRCUIT

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Dump Valve PWM output may be disconnected or the solenoid may be defective.

ENGINE POWERED MACHINES ONLY

Functions Disabled (Engine Powered Machines Only): Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.40.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise Go to step 2.40.2 Go to step 2.40.2
2.40.2	Disconnect solenoid at X087. Short X087.1.soc to X087.2.soc	Rerun System Test	Analyzer Message "DUMP VALVE SHORT TO GROUND" Analyzer Message "DUMP VALVE OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.40.3
2.40.3	Replace X002.9 with a jumper to X002.14	Rerun System Test	Analyzer Message "DUMP VALVE SHORT TO GROUND" Analyzer Message "DUMP VALVE OPEN CIRCUIT"	Wire Red/Wht 50-1-1 or Red/Wht 50-1 broken. Repair or replace Possible Cause: 4.1.10

2.41 DUMP SOLENOID SHORT TO BATTERY

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Dump Valve PWM output may be shorted to battery or the solenoid may be defective

ENGINE POWERED MACHINES ONLY

Functions Disabled (Engine Powered Machines Only): Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.41.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.41.2 Go to step 2.41.2
2.41.2	Disconnect solenoid at X087 and isolate wires	Rerun System Test	Analyzer Message "DUMP VALVE OPEN CIRCUIT" Analyzer Message "DUMP VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.41.3
2.41.3	Remove wire Red/Wht 50-1-1 from X002.9	Rerun System Test	Analyzer Message "DUMP VALVE OPEN CIRCUIT" Analyzer Message "DUMP VALVE SHORT TO BATTERY"	Wire Red/Wht 50-1-1 or Red/Wht 50-1 shorted to battery. Repair or replace Possible Cause: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.42 DUMP SOLENOID SHORT TO GROUND

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that Dump Valve PWM output may be shorted to ground or the solenoid may be defective

ENGINE POWERED MACHINES ONLY

Functions Disabled (Engine Powered Machines Only): Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.42.1	Disconnect solenoid at X087 and isolate wires	Rerun System Test	Analyzer Message "DUMPVALVE OPEN CIRCUIT" Analyzer Message "DUMPVALVE SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.42.2
2.42.2	Remove wire Red/Wht 50-1-1 from X002.9	Rerun System Test	Analyzer Message "DUMPVALVE OPEN CIRCUIT" Analyzer Message "DUMPVALVE SHORT TO GROUND"	Wire Red/Wht 50-1-1 or Red/Wht 50-1 shorted to ground. Repair or replace Possible Cause: 4.1.10

2.43 EEPROM FAILURE - CHECK ALL SETTINGS

Distress Lamp: 9

ADE Code: 9-9

The control system detected an internal memory failure. Personalities and Machine Setup settings may be reset to default values.

Functions Disabled: Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R), Engine Start, Engine Throttle Pull, Engine Throttle Hold, Engine Choke Pull, Engine Choke Hold

Possible Causes: 4.1.16, 4.1.10

2.44 ENGINE NOT RUNNING

Distress Lamp: 5

ADE Code: None

The control system does not detect that the engine is running (Engine RPM is Zero AND Machine Setup's POWER is set to 1=ENGINE). If the engine will not start, see 1.6 Engine Will Not Crank - Engine Models or 1.7 Engine Cranks But Will Not Start - Engine Models

ENGINE POWERED MACHINES ONLY

Functions Disabled (Engine Powered Machines Only): Lift Up, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.44.1	Start Engine	ANALYZER -> DIAGNOSTICS -> ENGINE SPEED > 0RPM?	Yes No	Possible Cause: 4.1.2, 4.1.10 Go to step 2.44.2
2.44.2		Check for continuity between X001.16.soc and X095	Yes No	Possible Cause: 4.1.21, 4.1.21, 4.1.2, 4.1.10 Repair WHT/YEL 48-7 or WHT/YEL 48-13-1 between X001.16 and X095

2.45 EXTEND O/R SOLENOID OPEN CIRCUIT

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that Extend Outrigger digital output may be disconnected from the relay or the relay may be defective.

Functions Disabled: Set (Extend O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.45.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise Go to step 2.45.2 Go to step 2.45.2
2.45.2	Disconnect solenoid at X086. Short X086.1.soc to X086.2.soc	Rerun System Test	Analyzer Message "EXTEND VALVE SHORT TO GROUND" Analyzer Message "EXTEND VALVE OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.45.3
2.45.3	Replace X003.13 with a jumper to X003.3	Rerun System Test	Analyzer Message "EXTEND VALVE SHORT TO GROUND" Analyzer Message "EXTEND VALVE OPEN CIRCUIT"	Wire Orn/Wht 55-3-1 or Orn/Wht 55-3 broken. Repair or replace Possible Cause: 4.1.10

2.46 EXTEND O/R SOLENOID SHORT TO BATTERY

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Extend Outrigger Valve digital output may be shorted to battery or the solenoid may be defective.

Functions Disabled: Set (Extend O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.46.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.46.2 Go to step 2.46.2
2.46.2	Disconnect solenoid at X086 and isolate wires	Rerun System Test	Analyzer Message "EXTEND VALVE OPEN CIRCUIT" Analyzer Message "EXTEND VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.46.3
2.46.3	Remove wire Orn/Wht 55-3-1 from X003.13	Rerun System Test	Analyzer Message "EXTEND VALVE OPEN CIRCUIT" Analyzer Message "EXTEND VALVE SHORT TO BATTERY"	Wire Orn/Wht 55-3-1 or Orn/Wht 55-3 shorted to battery. Repair or replace Possible Cause: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.47 EXTEND O/R SOLENOID SHORT TO GROUND

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Extend Outtrigger Valve digital output may be shorted to ground or the solenoid may be defective

Functions Disabled: Set (Extend O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.47.1	Disconnect solenoid at X086 and isolate wires	Rerun System Test	Analyzer Message "EXTEND VALVE OPEN CIRCUIT" Analyzer Message "EXTEND VALVE SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.47.2
2.47.2	Remove wire Orn/Wht 55-3-1 from X003.13	Rerun System Test	Analyzer Message "EXTEND VALVE OPEN CIRCUIT" Analyzer Message "EXTEND VALVE SHORT TO GROUND"	Orn/Wht 55-3-1 or Orn/Wht 55-3 shorted to ground. Repair or replace Possible Cause: 4.1.10

2.48 FRONT-LEFT O/R SOLENOID OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Front-Left Outtrigger digital output may be disconnected from the relay or the relay may be defective.

Functions Disabled: Front Left O/R

Step	Pretest Instructions	Test	Result	Corrective Action
2.48.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise Go to step 2.48.2 Go to step 2.48.2
2.48.2	Disconnect solenoid at X003.2 Short X046.1.soc to X046.2.soc	Rerun System Test	Analyzer Message "F-L OUTRIGGER VALVE SHORT TO GROUND" Analyzer Message "F-L OUTRIGGER VALVE OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.48.3
2.48.3	Replace X003.2 with a jumper to X003.3	Rerun System Test	Analyzer Message "F-L OUTRIGGER VALVE SHORT TO GROUND" Analyzer Message "F-L OUTRIGGER VALVE OPEN CIRCUIT"	Wire Orn/Red 49-5 or White wire to X046 broken. Repair or replace Possible Cause: 4.1.10

2.49 FRONT-LEFT O/R SOLENOID SHORT TO BATTERY

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Front-Left Outrigger Valve digital output may be shorted to battery or the solenoid may be defective.

Functions Disabled: Front Left O/R

Step	Pretest Instructions	Test	Result	Corrective Action
2.49.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.49.2 Go to step 2.49.2
2.49.2	Disconnect solenoid at X046 and isolate wires	Rerun System Test	Analyzer Message "F-L OUTRIGGER VALVE OPEN CIRCUIT" Analyzer Message "F-L OUTRIGGER VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.49.3
2.49.3	Remove wire Orn/Red 49-5 from X003.2	Rerun System Test	Analyzer Message "F-L OUTRIGGER VALVE OPEN CIRCUIT" Analyzer Message "F-L OUTRIGGER VALVE SHORT TO BATTERY"	Wire Orn/Red 49-5 or White wire to X046 shorted to battery. Repair or replace Possible Cause: 4.1.10

2.50 FRONT-LEFT O/R SOLENOID SHORT TO GROUND

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Front-Left Outrigger Valve digital output may be shorted to ground or the solenoid may be defective

Functions Disabled: Front Left O/R

Step	Pretest Instructions	Test	Result	Corrective Action
2.50.1	Disconnect solenoid at X046 and isolate wires	Rerun System Test	Analyzer Message "F-L OUTRIGGER VALVE OPEN CIRCUIT" Analyzer Message "F-L OUTRIGGER VALVE SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.50.2
2.50.2	Remove wire Orn/Red 49-5 from X003.2	Rerun System Test	Analyzer Message "F-L OUTRIGGER VALVE OPEN CIRCUIT" Analyzer Message "F-L OUTRIGGER VALVE SHORT TO GROUND"	Wire Orn/Red 49-5 or White wire to X046 shorted to ground. Repair or replace Possible Cause: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.51 FRONT-RIGHT O/R SOLENOID OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Front-Right Outrigger digital output may be disconnected from the relay or the relay may be defective.

Functions Disabled: Front Right O/R

Step	Pretest Instructions	Test	Result	Corrective Action
2.51.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise Go to step 2.51.2 Go to step 2.51.2
2.51.2	Disconnect solenoid at X047. Short X047.1.soc to X047.2.soc	Rerun System Test	Analyzer Message "F-R OUTRIGGER VALVE SHORT TO GROUND" Analyzer Message "F-R OUTRIGGER VALVE OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.51.3
2.51.3	Replace X003.6 with a jumper to X003.3	Rerun System Test	Analyzer Message "F-R OUTRIGGER VALVE SHORT TO GROUND" Analyzer Message "F-R OUTRIGGER VALVE OPEN CIRCUIT"	Wire Orn/Red 49-6 or White wire to X047 broken. Repair or replace Possible Cause: 4.1.10

2.52 FRONT-RIGHT O/R SOLENOID SHORT TO BATTERY

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Front-Right Outrigger Valve digital output may be shorted to battery or the solenoid may be defective.

Functions Disabled: Front Right O/R

Step	Pretest Instructions	Test	Result	Corrective Action
2.52.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.52.2 Go to step 2.52.2
2.52.2	Disconnect solenoid at X047 and isolate wires	Rerun System Test	Analyzer Message "F-R OUTRIGGER VALVE OPEN CIRCUIT" Analyzer Message "F-R OUTRIGGER VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.52.3
2.52.3	Remove wire Orn/Red 49-6 from X003.6	Rerun System Test	Analyzer Message "F-R OUTRIGGER VALVE OPEN CIRCUIT" Analyzer Message "F-R OUTRIGGER VALVE SHORT TO BATTERY"	Wire Orn/Red 49-6 or White wire to X047 shorted to battery. Repair or replace Possible Cause: 4.1.10

2.53 FRONT-RIGHT O/R SOLENOID SHORT TO GROUND

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Front-Right Outrigger Valve digital output may be shorted to ground or the solenoid may be defective

Functions Disabled: Front Right O/R

Step	Pretest Instructions	Test	Result	Corrective Action
2.53.1	Disconnect solenoid at X047 and isolate wires	Rerun System Test	Analyzer Message "F-R OUTRIGGER VALVE OPEN CIRCUIT" Analyzer Message "F-R OUTRIGGER VALVE SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.53.2
2.53.2	Remove wire Orn/Red 49-6 from X003.6	Rerun System Test	Analyzer Message "F-R OUTRIGGER VALVE OPEN CIRCUIT" Analyzer Message "F-R OUTRIGGER VALVE SHORT TO GROUND"	Wire Orn/Red 49-6 or White wire to X047 shorted to ground. Repair or replace Possible Cause: 4.1.10

2.54 FUNCTION LOCKED OUT - JOYSTICK NOT CENTERED AT STARTUP

Distress Lamp: 1 ADE Code: 2-2

The joystick signal was not at the proper voltage level for neutral (determined from personalities) when the platform was powered.

Functions Disabled at Platform Only: Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.54.1		Does the joystick return to the centered position when moved?	Yes No	Go to step 2.54.2 Possible Cause: 4.1.22
2.54.2		Perform a check of the Joystick, see 3.10 Joystick Diagnostics	Fault still present after power cycle	Go to step 2.54.3
2.54.3	Perform the voltmeter joystick test of 3.10 Joystick Diagnostics while powering the machine	Using a multimeter, is the voltage between X061.4 and X062.2 between 2.25V and 2.75V?	Yes No	Go to step 2.54.4 Possible Causes: 4.1.22, 4.1.11
2.54.4	Perform the voltmeter joystick test of 3.10 Joystick Diagnostics while powering the machine	Using a multimeter, is the voltage between X061.3 and X062.2 between 2.25V and 2.75V?	Yes No	Possible Causes: 4.1.11 Possible Causes: 4.1.22, 4.1.11

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.55 FUNCTION LOCKED OUT - TRIGGER PERMANENTLY CLOSED

Distress Lamp: 1

ADE Code: 2-2

The platform trigger was closed when the platform was powered. The switch could be accidentally held, mechanically stuck, or electrically shorted.

Functions Disabled at Platform Only: Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.55.1		Is the trigger mechanically stuck?	Yes No	Repair or replace the joystick trigger Go to step 2.55.2
2.55.2	Disconnect X061. Make sure trigger is not engaged.	Test for continuity between X061.5.pin and X061.6.pin.	Yes No	Possible Causes: 4.1.22 Go to step 2.55.3
2.55.3	Disconnect X061	Pull the ground emergency stop switch and place key switch in platform position	Fault Message "JOYSTICK FAULTY - Y AXIS WIPER OUT OF RANGE" Fault Message "FUNCTION LOCKED OUT - TRIGGER PERMANENTLY CLOSED"	Possible Causes: 4.1.22 Go to step 2.55.4
2.55.4	Place key switch in the platform position and pull the emergency stop switches. Using the analyzer, navigate to DIAGNOSTICS -> PLATFORM	Does the displayed function selected change as you change the rotatory select switch?	Yes No	Repair the Yel/Red 2-17 wire between X060.6 and X063 or the rotary select switch Go to step 2.55.5
2.55.5	Place key switch in the platform position and pull the emergency stop switches. Using the analyzer, navigate to DIAGNOSTICS -> PLATFORM	With the rotary selector switch in the platform leveling position which function does the analyzer show is selected?	Diagnostic Message "LEVEL SELECT" Diagnostic Message "LIFT/SWING SEL" Diagnostic Message "JIB/TELE SELECT"	Possible Causes: Short in wire Orn/Red 49-27, 4.1.11 Possible Causes: Short in wire Orn/Red 49-26, 4.1.11 Repair short in wire Orn/Red 49-31 Possible Cause: 4.1.11

2.56 FUNCTION PROBLEM - ENGINE CHOKE PERMANENTLY SELECTED

Distress Lamp: 1

ADE Code: 2-2

The platform engine choke switch was closed when the platform was powered. The switch could be accidentally held, mechanically stuck, or electrically shorted.

ENGINE POWERED MACHINES ONLY

Functions Disabled at Platform Only: Engine Choke Pull, Engine Choke Hold

Step	Pretest Instructions	Test	Result	Corrective Action
2.56.1		Is the switch mechanically stuck?	Yes No	Repair or replace the switch Go to step 2.56.2
2.56.2	Disconnect X064. Place key switch in the platform position and pull the emergency stop switches.	Is fault "Function Problem - Engine Choke Permanently Selected" still present?	Yes No	Go to step 2.56.3 Possible Causes: 4.1.18
2.56.3	Place key switch in the platform position and pull the emergency stop switches.	Measured voltage at X060.14 = Vbatt?	Yes No	Possible Causes: Short in Orn/Red 49-30 wire, 4.1.11 Possible Causes: 4.1.11

2.57 FUNCTION PROBLEM - ENGINE CHOKE PERMANENTLY SELECTED

Distress Lamp: 1 ADE Code: 2-3

The ground engine choke switch was closed when the machine was powered. The switch could be accidentally held, mechanically stuck, or electrically shorted.

ENGINE POWERED MACHINES ONLY

Functions Disabled: Engine Choke Pull, Engine Choke Hold

Step	Pretest Instructions	Test	Result	Corrective Action
2.57.1		Is the switch mechanically stuck?	Yes No	Repair or replace the switch Go to step 2.57.2
2.57.2	Disconnect X035. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Engine Choke Permanently Selected" still present?	Yes No	Go to step 2.57.3 Possible Causes: 4.1.18
2.57.3	Remove X014.13.pin from X014. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Engine Choke Permanently Selected" still present?	Yes No	Go to step 2.57.4 Possible Causes: Short in Wht/Yel 48-9 wire
2.57.4	Pull the emergency stop switches and place key switch in the ground position	Measured voltage at X004.16 = Vbatt?	Yes No	Possible Causes: Short in Wht/Yel 48-9-1 wire, 4.1.10 Possible Causes: 4.1.10

2.58 FUNCTION PROBLEM - ENGINE START PERMANENTLY SELECTED

Distress Lamp: 1 ADE Code: 2-2

The platform engine start switch was closed when the platform was powered. The switch could be accidentally held, mechanically stuck, or electrically shorted.

ENGINE POWERED MACHINES ONLY

Functions Disabled at Platform Only: Engine Start, Engine Throttle Pull, Engine Throttle Hold

Step	Pretest Instructions	Test	Result	Corrective Action
2.58.1		Is the switch mechanically stuck?	Yes No	Repair or replace the switch Go to step 2.58.2
2.58.2	Disconnect X065. Place key switch in the platform position and pull the emergency stop switches.	Is fault "Function Problem - Engine Start Permanently Selected" still present?	Yes No	Go to step 2.58.3 Possible Causes: 4.1.18
2.58.3	Place key switch in the platform position and pull the emergency stop switches.	Measured voltage at X060.13 = Vbatt?	Yes No	Possible Causes: Short in Wht/Yel 48-1 wire, 4.1.11 Possible Causes: 4.1.11

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.59 FUNCTION PROBLEM - ENGINE START PERMANENTLY SELECTED

Distress Lamp: 1

ADE Code: 2-3

The ground engine start switch was closed when the machine was powered. The switch could be accidentally held, mechanically stuck, or electrically shorted.

ENGINE POWERED MACHINES ONLY

Functions Disabled: Engine Start, Engine Throttle Pull, Engine Throttle Hold

Step	Pretest Instructions	Test	Result	Corrective Action
2.59.1		Is the switch mechanically stuck?	Yes No	Repair or replace the switch Go to step 2.59.2
2.59.2	Disconnect X036. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Engine Start Permanently Selected" still present?	Yes No	Go to step 2.59.3 Possible Causes: 4.1.18
2.59.3	Remove X014.14.pin from X014. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Engine Start Permanently Selected" still present?	Yes No	Go to step 2.59.4 Possible Causes: Short in Wht/Yel 48-1 wire
2.59.4	Place key switch in ground position and pull the emergency stop switch.	Measured voltage at X004.4 = Vbatt?	Yes No	Possible Causes: Short in Wht/Yel 48-1-1 wire, 4.1.10 Possible Causes: 4.1.10

2.60 FUNCTION PROBLEM - JIB DOWN PERMANENTLY SELECTED

Distress Lamp: 1

ADE Code: 2-3

The ground jib down switch was closed when the machine was powered. The switch could be accidentally held, mechanically stuck, or electrically shorted.

T500J MODELS ONLY

Functions Disabled at Ground Only: Jib Down

Step	Pretest Instructions	Test	Result	Corrective Action
2.60.1		Is the switch mechanically stuck?	Yes No	Repair or replace the switch Go to step 2.60.2
2.60.2	Disconnect X032. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Jib Down Permanently Selected" still present?	Yes No	Go to step 2.60.3 Possible Causes: 4.1.18
2.60.3	Remove X014.24.pin from X014. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Jib Down Permanently Selected" still present?	Yes No	Go to step 2.60.4 Possible Causes: Short in Blue 28-2 wire
2.60.4	Place key switch in ground position and pull the emergency stop switch.	Measured voltage at X004.8 = Vbatt?	Yes No	Possible Causes: Short in Blue 28-2-1 wire, 4.1.10 Possible Causes: 4.1.10

2.61 FUNCTION PROBLEM - JIB UP AND DOWN BOTH SELECTED

Distress Lamp: 9

ADE Code: 2-3

The digital inputs from both jib up and jib down ground panel switches are active.

T500J MODELS ONLY

Functions Disabled at Ground Only: Jib Up, Jib Down

Step	Pretest Instructions	Test	Result	Corrective Action
2.61.1	Disconnect X032. Pull the ground emergency stop switch and place key switch in the ground position	Is fault "Function Problem - Jib Up And Down Both Selected" still present?	Yes No	Go to step 2.61.2 Possible Causes: 4.1.18
2.61.2	Disconnect X014. Hold the enable switch.	Measure continuity between X014.25.pin and X014.1.pin	Yes No	Possible Causes: Short in Blue 27-2 wire. Go to step 2.61.3
2.61.3	Disconnect X014. Hold the enable switch.	Measure continuity between X014.24.pin and X014.1.pin	Yes No	Possible Causes: Short in Blue 28-2 wire. Go to step 2.61.4
2.61.4	Remove X004.19.soc from X004	Is fault "Function Problem - Jib Up And Down Both Selected" still present?	Yes No	Possible Causes: 4.1.10 Possible Causes: Short in Blue 27-2-1 wire or Blue 28-2-1 wire

2.62 FUNCTION PROBLEM - JIB UP PERMANENTLY SELECTED

Distress Lamp: 1

ADE Code: 2-3

The ground jib up switch was closed when the machine was powered. The switch could be accidentally held, mechanically stuck, or electrically shorted.

T500J MODELS ONLY

Functions Disabled at Ground Only: Jib Up

Step	Pretest Instructions	Test	Result	Corrective Action
2.62.1		Is the switch mechanically stuck?	Yes No	Repair or replace the switch Go to step 2.62.2
2.62.2	Disconnect X032. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Jib Up Permanently Selected" still present?	Yes No	Go to step 2.62.3 Possible Causes: 4.1.18
2.62.3	Remove X014.25.pin from X014. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Jib Up Permanently Selected" still present?	Yes No	Go to step 2.62.4 Possible Causes: Short in Blue 27-2 wire
2.62.4	Place key switch in ground position and pull the emergency stop switch.	Measured voltage at X004.19 = Vbatt?	Yes No	Possible Causes: Short in Blue 27-2-1 wire, 4.1.10 Possible Causes: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.63 FUNCTION PROBLEM - LEVEL DOWN PERMANENTLY SELECTED

Distress Lamp: 1

ADE Code: 2-3

The ground level down switch was closed when the machine was powered. The switch could be accidentally held, mechanically stuck, or electrically shorted.

Functions Disabled at Ground Only: Level Down

Step	Pretest Instructions	Test	Result	Corrective Action
2.63.1		Is the switch mechanically stuck?	Yes No	Repair or replace the switch Go to step 2.63.2
2.63.2	Disconnect X034. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Level Down Permanently Selected" still present?	Yes No	Go to step 2.63.3 Possible Causes: 4.1.18
2.63.3	Remove X014.26.pin from X014. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Level Down Permanently Selected" still present?	Yes No	Go to step 2.63.4 Possible Causes: Short in Pink 26-2 wire
2.63.4	Place key switch in ground position and pull the emergency stop switch.	Measured voltage at X004.5 = Vbatt?	Yes No	Possible Causes: Short in Pink 26-2-1 wire, 4.1.10 Possible Causes: 4.1.10

2.64 FUNCTION PROBLEM - LEVEL UP AND DOWN BOTH SELECTED

Distress Lamp: 9

ADE Code: 2-3

The digital inputs from both level up and level down ground panel switches are active.

Functions Disabled at Ground Only: Level Up, Level Down

Step	Pretest Instructions	Test	Result	Corrective Action
2.64.1	Disconnect X034. Pull the ground emergency stop switch and place key switch in the ground position	Is fault "Function Problem - Level Up And Down Both Selected" still present?	Yes No	Go to step 2.64.2 Possible Causes: 4.1.18
2.64.2	Disconnect X014. Hold the enable switch.	Measure continuity between X014.27.pin and X014.1.pin	Yes No	Possible Causes: Short in Pink 25-2 wire. Go to step 2.64.3
2.64.3	Disconnect X014. Hold the enable switch.	Measure continuity between X014.26.pin and X014.1.pin	Yes No	Possible Causes: Short in Pink 26-2 wire. Go to step 2.64.4
2.64.4	Remove X004.17.soc from X004	Is fault "Function Problem - Level Up And Down Both Selected" still present?	Yes No	Possible Causes: 4.1.10 Possible Causes: Short in Pink 25-2-1 wire or Pink 26-2-1 wire

2.65 FUNCTION PROBLEM - LEVEL UP PERMANENTLY SELECTED

Distress Lamp: 1 ADE Code: 2-3

The ground level up switch was closed when the machine was powered. The switch could be accidentally held, mechanically stuck, or electrically shorted.

Functions Disabled at Ground Only: Level Up

Step	Pretest Instructions	Test	Result	Corrective Action
2.65.1		Is the switch mechanically stuck?	Yes No	Repair or replace the switch Go to step 2.65.2
2.65.2	Disconnect X034. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Level Up Permanently Selected" still present?	Yes No	Go to step 2.65.3 Possible Causes: 4.1.18
2.65.3	Remove X014.27.pin from X014. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Level Up Permanently Selected" still present?	Yes No	Go to step 2.65.4 Possible Causes: Short in Pink 25-2 wire
2.65.4	Place key switch in ground position and pull the emergency stop switch.	Measured voltage at X004.17 = Vbatt?	Yes No	Possible Causes: Short in Pink 25-2-1 wire, 4.1.10 Possible Causes: 4.1.10

2.66 FUNCTION PROBLEM - LIFT DOWN PERMANENTLY SELECTED

Distress Lamp: 1 ADE Code: 2-3

The ground lift down switch was closed when the machine was powered. The switch could be accidentally held, mechanically stuck, or electrically shorted.

Functions Disabled at Ground Only: Lift Down

Step	Pretest Instructions	Test	Result	Corrective Action
2.66.1		Is the switch mechanically stuck?	Yes No	Repair or replace the switch Go to step 2.66.2
2.66.2	Disconnect X031. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Lift Down Permanently Selected" still present?	Yes No	Go to step 2.66.3 Possible Causes: 4.1.18
2.66.3	Remove X014.22.pin from X014. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Lift Down Permanently Selected" still present?	Yes No	Go to step 2.66.4 Possible Causes: Short in Tan 4-2 wire
2.66.4	Place key switch in ground position and pull the emergency stop switch.	Measured voltage at X004.33 = Vbatt?	Yes No	Possible Causes: Short in Tan 4-2-1 wire, 4.1.10 Possible Causes: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.67 FUNCTION PROBLEM - LIFT UP AND DOWN BOTH SELECTED

Distress Lamp: 9

ADE Code: 2-3

The digital inputs from both lift up and lift down ground panel switches are active.

Functions Disabled at Ground Only: Lift Up, Lift Down

Step	Pretest Instructions	Test	Result	Corrective Action
2.67.1	Disconnect X031. Pull the ground emergency stop switch and place key switch in the ground position	Is fault "Function Problem - Lift Up And Down Both Selected" still present?	Yes No	Go to step 2.67.2 Possible Causes: 4.1.18
2.67.2	Disconnect X014. Hold the enable switch.	Measure continuity between X014.23.pin and X014.1.pin	Yes No	Possible Causes: Short in Tan 3-2 wire. Go to step 2.67.3
2.67.3	Disconnect X014. Hold the enable switch.	Measure continuity between X014.22.pin and X014.1.pin	Yes No	Possible Causes: Short in Tan 4-2 wire. Go to step 2.67.4
2.67.4	Remove X004.23.soc from X004	Is fault "Function Problem - Lift Up And Down Both Selected" still present?	Yes No	Possible Causes: 4.1.10 Possible Causes: Short in Tan 3-2-1 wire or Tan 4-2-1 wire

2.68 FUNCTION PROBLEM - LIFT UP PERMANENTLY SELECTED

Distress Lamp: 1

ADE Code: 2-3

The ground lift up switch was closed when the machine was powered. The switch could be accidentally held, mechanically stuck, or electrically shorted.

Functions Disabled at Ground Only: Lift Up

Step	Pretest Instructions	Test	Result	Corrective Action
2.68.1		Is the switch mechanically stuck?	Yes No	Repair or replace the switch Go to step 2.68.2
2.68.2	Disconnect X031. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Lift Up Permanently Selected" still present?	Yes No	Go to step 2.68.3 Possible Causes: 4.1.18
2.68.3	Remove X014.23.pin from X014. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Lift Up Permanently Selected" still present?	Yes No	Go to step 2.68.4 Possible Causes: Short in Tan 3-2 wire
2.68.4	Place key switch in ground position and pull the emergency stop switch.	Measured voltage at X004.23 = Vbatt?	Yes No	Possible Causes: Short in Tan 3-2-1 wire, 4.1.10 Possible Causes: 4.1.10

2.69 FUNCTION PROBLEM - OUTRIGGER SET AND STOW BOTH SELECTED

Distress Lamp: 9

ADE Code: 2-3

The digital inputs from both O/R stow and O/R set ground panel switches are active.

Functions Disabled: Set (Extend O/R), Stow (Retract O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.69.1	Disconnect X023. Pull the ground emergency stop switch and place key switch in the ground position	Is fault "Function Problem - Outrigger Set And Stow Both Selected" still present?	Yes No	Go to step 2.69.2 Possible Causes: 4.1.18
2.69.2	Disconnect X014. Hold the enable switch.	Measure continuity between X014.5.pin and X014.1.pin	Yes No	Possible Causes: Short in Orn/Wht 55-2 wire. Go to step 2.69.3
2.69.3	Disconnect X014. Hold the enable switch.	Measure continuity between X014.6.pin and X014.1.pin	Yes No	Possible Causes: Short in Orn/Wht 55-1 wire. Go to step 2.69.4
2.69.4	Remove X004.20.soc from X004	Is fault "Function Problem - Outrigger Set And Stow Both Selected" still present?	Yes No	Possible Causes: 4.1.10 Possible Causes: Short in Orn/Wht 55-2-1 wire or Orn/Wht 55-1-1 wire

2.70 FUNCTION PROBLEM - OUTRIGGER SET PERMANENTLY SELECTED

Distress Lamp: 1

ADE Code: 2-3

The ground O/R Set switch was closed when the machine was powered. The switch could be accidentally held, mechanically stuck, or electrically shorted.

Functions Disabled at Ground Only: Set (Extend O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.70.1		Is the switch mechanically stuck?	Yes No	Repair or replace the switch Go to step 2.70.2
2.70.2	Disconnect X023. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Outrigger Set Permanently Selected" still present?	Yes No	Go to step 2.70.3 Possible Causes: 4.1.18
2.70.3	Remove X014.5.pin from X014. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Outrigger Set Permanently Selected" still present?	Yes No	Go to step 2.70.4 Possible Causes: Short in Orn/Wht 55-2 wire
2.70.4	Place key switch in ground position and pull the emergency stop switch.	Measured voltage at X004.20 = Vbatt?	Yes No	Possible Causes: Short in Orn/Wht 55-2-1 wire, 4.1.10 Possible Causes: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.71 FUNCTION PROBLEM - OUTRIGGER STOW PERMANENTLY SELECTED

Distress Lamp: 1

ADE Code: 2-3

The ground Outrigger Stow switch was closed when the machine was powered. The switch could be accidentally held, mechanically stuck, or electrically shorted.

Functions Disabled at Ground Only: Stow (Retract O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.71.1		Is the switch mechanically stuck?	Yes No	Repair or replace the switch Go to step 2.71.2
2.71.2	Disconnect X023. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Outrigger Stow Permanently Selected" still present?	Yes No	Go to step 2.71.3 Possible Causes: 4.1.18
2.71.3	Remove X014.6 pin from X014. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Outrigger Stow Permanently Selected" still present?	Yes No	Go to step 2.71.4 Possible Causes: Short in Orn/Wht 55-1 wire
2.71.4	Place key switch in ground position and pull the emergency stop switch.	Measured voltage at X004.9 = Vbatt?	Yes No	Possible Causes: Short in Orn/Wht 55-1-1 wire, 4.1.10 Possible Causes: 4.1.10

2.72 FUNCTION PROBLEM - ROTARY SELECTOR SWITCH

Distress Lamp: 9

ADE Code: 2-2

More than one of the three digital inputs from the platform rotary selector switch are active. Only one of the inputs should be active at one time to indicate the selected mode.

Functions Disabled at Platform Only: Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.72.1	Disconnect X063. Place key switch in the platform position and pull the emergency stop switches.	Is fault "Function Problem - Rotary Selector Switch" still present?	Yes No	Go to step 2.72.2 Possible Causes: 4.1.18
2.72.2	Place key switch in the platform position and pull the emergency stop switches. Turn the selector switch to the center position, Lift/Swing.	While holding the enable switch, check Level, Lift/SW, and JIB/Tele switches for "Closed" status in ANALYZER -> DIAGNOSTICS -> PLATFORM	LIFT/SW CLOSED and LEVEL CLOSED LIFT/SW CLOSED and JIB/TELE CLOSED Any other combination	Possible Causes: Short in Orn/Red 49-27 wire, 4.1.11 Possible Causes: Short in Orn/Red 49-29 wire, 4.1.11 Go to step 2.72.3
2.72.3	Place key switch in the platform position and pull the emergency stop switches. Turn the selector switch to the right position, JIB/Tele	While holding the enable switch, check Level, Lift/SW, and JIB/Tele switches for "Closed" status in ANALYZER -> DIAGNOSTICS -> PLATFORM	JIB/TELE CLOSED and LEVEL CLOSED JIB/TELE CLOSED and LIFT/SW CLOSED Any other combination	Possible Causes: Short in Orn/Red 49-27 wire, 4.1.11 Possible Causes: Short in Orn/Red 49-28 wire, 4.1.11 Possible Causes: 4.1.11

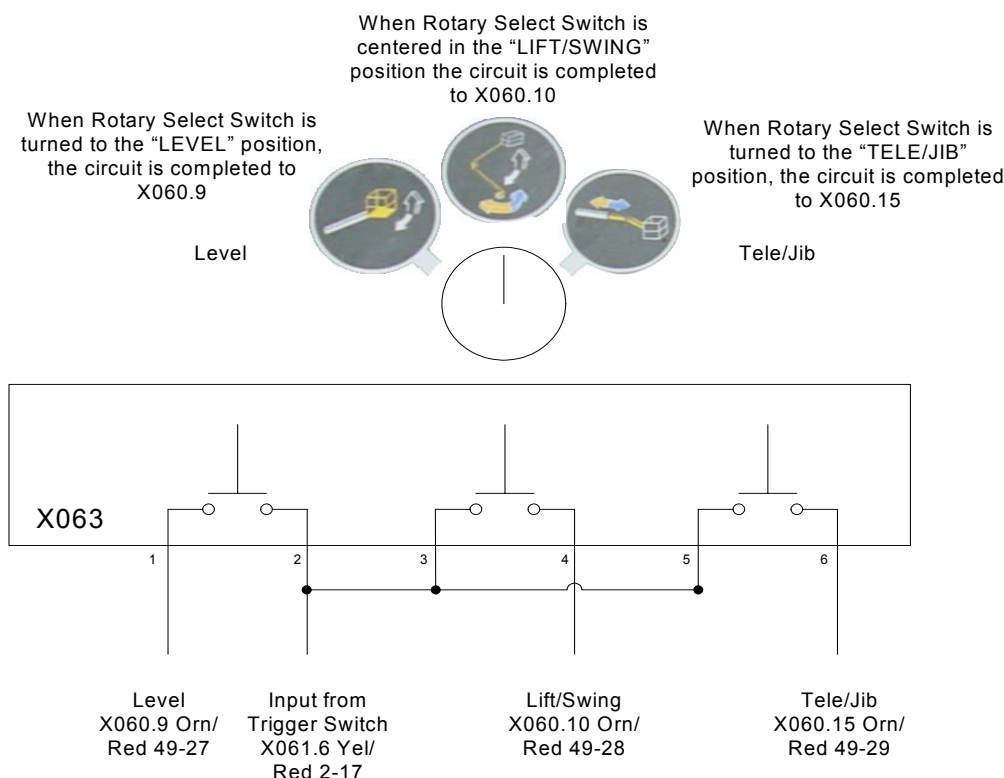


Figure 2-1. Platform Rotary Select Switch

2.73 FUNCTION PROBLEM - SWING LEFT AND RIGHT BOTH SELECTED

Distress Lamp: 9

ADE Code: 2-3

The digital inputs from both swing left and swing right ground panel switches are active.

Functions Disabled at Ground Only: Swing Left, Swing Right

Step	Pretest Instructions	Test	Result	Corrective Action
2.73.1	Disconnect X024. Pull the ground emergency stop switch and place key switch in the ground position	Is fault "Function Problem - Swing Left And Right Both Selected" still present?	Yes No	Go to step 2.73.2 Possible Causes: 4.1.18
2.73.2	Disconnect X014. Hold the enable switch.	Measure continuity between X014.18.pin and X014.1.pin	Yes No	Possible Causes: Short in White 22-2 wire. Go to step 2.73.3
2.73.3	Disconnect X014. Hold the enable switch.	Measure continuity between X014.19.pin and X014.1.pin	Yes No	Possible Causes: Short in White 21-2 wire. Go to step 2.73.4
2.73.4	Remove X004.35.soc from X004	Is fault "Function Problem - Swing Left And Right Both Selected" still present?	Yes No	Possible Causes: 4.1.10 Possible Causes: Short in White 22-2-1 wire or White 21-2-1 wire

2.74 FUNCTION PROBLEM - SWING LEFT PERMANENTLY SELECTED

Distress Lamp: 1

ADE Code: 2-3

The ground swing left switch was closed when the machine was powered. The switch could be accidentally held, mechanically stuck, or electrically shorted.

Functions Disabled at Ground Only: Swing Left

Step	Pretest Instructions	Test	Result	Corrective Action
2.74.1		Is the switch mechanically stuck?	Yes No	Repair or replace the switch Go to step 2.74.2
2.74.2	Disconnect X024. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Swing Left Permanently Selected" still present?	Yes No	Go to step 2.74.3 Possible Causes: 4.1.18
2.74.3	Remove X014.19.pin from X014. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Swing Left Permanently Selected" still present?	Yes No	Go to step 2.74.4 Possible Causes: Short in White 21-2 wire
2.74.4	Place key switch in ground position and pull the emergency stop switch.	Measured voltage at X004.34 = Vbatt?	Yes No	Possible Causes: Short in White 21-2-1 wire, 4.1.10 Possible Causes: 4.1.10

2.75 FUNCTION PROBLEM - SWING RIGHT PERMANENTLY SELECTED

Distress Lamp: 1

ADE Code: 2-3

The ground swing right switch was closed when the machine was powered. The switch could be accidentally held, mechanically stuck, or electrically shorted.

Functions Disabled at Ground Only: Swing Right

Step	Pretest Instructions	Test	Result	Corrective Action
2.75.1		Is the switch mechanically stuck?	Yes No	Repair or replace the switch Go to step 2.75.2
2.75.2	Disconnect X024. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Swing Right Permanently Selected" still present?	Yes No	Go to step 2.75.3 Possible Causes: 4.1.18
2.75.3	Remove X014.18.pin from X014. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Swing Right Permanently Selected" still present?	Yes No	Go to step 2.75.4 Possible Causes: Short in White 22-2 wire
2.75.4	Place key switch in ground position and pull the emergency stop switch.	Measured voltage at X004.35 = Vbatt?	Yes No	Possible Causes: Short in White 22-2-1 wire, 4.1.10 Possible Causes: 4.1.10

2.76 FUNCTION PROBLEM - TELESCOPE IN AND OUT BOTH SELECTED

Distress Lamp: 9

ADE Code: 2-3

The digital inputs from both telescope in and telescope out ground panel switches are active.

Functions Disabled at Ground Only: Telescope In, Telescope Out

Step	Pretest Instructions	Test	Result	Corrective Action
2.76.1	Disconnect X033. Pull the ground emergency stop switch and place key switch in the ground position	Is fault "Function Problem - Telescope In And Out Both Selected" still present?	Yes No	Go to step 2.76.2 Possible Causes: 4.1.18
2.76.2	Disconnect X014. Hold the enable switch.	Measure continuity between X014.20.pin and X014.1.pin	Yes No	Possible Causes: Short in Brown 13-2 wire. Go to step 2.76.3
2.76.3	Disconnect X014. Hold the enable switch.	Measure continuity between X014.21.pin and X014.1.pin	Yes No	Possible Causes: Short in Brown 14-2 wire. Go to step 2.76.4
2.76.4	Remove X004.7.soc from X004	Is fault "Function Problem - Telescope In And Out Both Selected" still present?	Yes No	Possible Causes: 4.1.10 Possible Causes: Short in Brown 13-2-1 wire or Brown 14-2-1 wire

2.77 FUNCTION PROBLEM - TELESCOPE IN PERMANENTLY SELECTED

Distress Lamp: 1

ADE Code: 2-3

The ground telescope in switch was closed when the machine was powered. The switch could be accidentally held, mechanically stuck, or electrically shorted.

Functions Disabled at Ground Only: Telescope In

Step	Pretest Instructions	Test	Result	Corrective Action
2.77.1		Is the switch mechanically stuck?	Yes No	Repair or replace the switch Go to step 2.77.2
2.77.2	Disconnect X033. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Telescope In Permanently Selected" still present?	Yes No	Go to step 2.77.3 Possible Causes: 4.1.18
2.77.3	Remove X014.20.pin from X014. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Telescope In Permanently Selected" still present?	Yes No	Go to step 2.77.4 Possible Causes: Short in Brown 13-2 wire
2.77.4	Place key switch in ground position and pull the emergency stop switch.	Measured voltage at X004.7 = Vbatt?	Yes No	Possible Causes: Short in Brown 13-2-1 wire, 4.1.10 Possible Causes: 4.1.10

2.78 FUNCTION PROBLEM - TELESCOPE OUT PERMANENTLY SELECTED

Distress Lamp: 1 ADE Code: 2-3

The ground telescope out switch was closed when the machine was powered. The switch could be accidentally held, mechanically stuck, or electrically shorted.

Functions Disabled at Ground Only: Telescope Out

Step	Pretest Instructions	Test	Result	Corrective Action
2.78.1		Is the switch mechanically stuck?	Yes No	Repair or replace the switch Go to step 2.78.2
2.78.2	Disconnect X033. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Telescope Out Permanently Selected" still present?	Yes No	Go to step 2.78.3 Possible Causes: 4.1.18
2.78.3	Remove X014.21 pin from X014. Place key switch in ground position and pull the emergency stop switch.	Is fault "Function Problem - Telescope Out Permanently Selected" still present?	Yes No	Go to step 2.78.4 Possible Causes: Short in Brown 14-2 wire
2.78.4	Place key switch in ground position and pull the emergency stop switch.	Measured voltage at X004.30 = Vbatt?	Yes No	Possible Causes: Short in Brown 14-2-1 wire, 4.1.10 Possible Causes: 4.1.10

2.79 FUNCTIONS AT CUTBACK - POWER MODULE CURRENT LIMIT

Distress Lamp: 4 ADE Code: 4-2

The Power Module is approaching its thermal limit and must reduce output to continue operation. The Power Module LED is Flashing 8 - Controller Hot.

ELECTRIC POWERED MACHINES ONLY

All Functions Operable, but output from power module is at reduced power

Possible Causes: 4.1.1, 4.1.39, 4.1.12

2.80 FUNCTIONS LOCKED OUT - CONSTANT DATA VERSION IMPROPER

Distress Lamp: 9 ADE Code: 9-9

Ground Module detected that the Application's Constant Data Version did not match the version embedded in Constant Data's Flash Structure. The control system may resume operation once the difficulty has been corrected

Functions Disabled: Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R), Engine Start, Engine Throttle Pull, Engine Throttle Hold, Engine Choke Pull, Engine Choke Hold

Possible Causes: 4.1.10

2.81 FUNCTIONS LOCKED OUT - PLATFORM MODULE SOFTWARE VERSION IMPROPER

Distress Lamp: 9 ADE Code: 9-9

The Platform Module reported a Software Major Version that was not compatible with the rest of the system. The control system may resume operation once the difficulty has been corrected.

Functions Disabled at Platform Only: Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R), Engine Start, Engine Throttle Pull, Engine Throttle Hold, Engine Choke Pull, Engine Choke Hold

Possible Causes: 4.1.13, 4.1.11

2.82 FUNCTIONS LOCKED OUT - POWER MODULE SOFTWARE VERSION IMPROPER

Distress Lamp: 9 ADE Code: 9-9

The Power Module reported a Software Major Version that was not compatible with the rest of the system. The control system may resume operation once the difficulty has been corrected.

ELECTRIC POWERED MACHINES ONLY

Functions Disabled: Lift Up, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R)

Possible Causes: 4.1.13, 4.1.12

2.83 GROUND ALARM SHORT TO BATTERY

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the ground alarm PWM output may be shorted to battery or another function

All Functions Operable

Step	Pretest Instructions	Test	Result	Corrective Action
2.83.1	Disconnect alarm at X028 and isolate wires	Is the fault removed?	Yes No	Possible Causes: 4.1.25 Go to step 2.83.2
2.83.2	Remove X014.17 from X014	Is the fault removed?	Yes No	Wire Orn/Red 49-11 or black ground wire shorted to battery. Repair or replace Go to step 2.83.3
2.83.3	Remove X002.19 from X002	Is the fault removed?	Yes No	Wire Orn/Red 49-11-1 shorted to battery. Repair or replace Possible Causes: 4.1.10

2.84 GROUND ALARM SHORT TO GROUND

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that ground alarm PWM output may be shorted to ground or the solenoid may be defective

All Functions Operable

Step	Pretest Instructions	Test	Result	Corrective Action
2.84.1	Disconnect alarm at X028 and isolate wires	Is the fault removed?	Yes No	Possible Causes: 4.1.25 Go to step 2.84.2
2.84.2	Remove X014.17 from X014	Is the fault removed?	Yes No	Wire Orn/Red 49-11 or black ground wire shorted to ground. Repair or replace Go to step 2.84.3
2.84.3	Remove X002.19 from X002	Is the fault removed?	Yes No	Wire Orn/Red 49-11-1 shorted to ground. Repair or replace Possible Causes: 4.1.10

2.85 GROUND MODULE FAILURE: REF VOLTAGE OUT OF RANGE

Distress Lamp: 9

ADE Code: 9-9

The Ground Module has detected that the +7V reference voltage source is out of range. This may be caused by a wiring short to one of the reference voltage pins on the Ground Module, or by a faulty Ground Module

All Functions Operable

Possible Causes: 4.1.10

2.86 GROUND MODULE FAILURE: VLOW FET FAILURE

Distress Lamp: 9

ADE Code: 9-9

The control system will not function because the Ground Module has experienced a hardware failure that prevents it from reading High-Sensing Digital Inputs.

Functions Disabled: Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R), Engine Start, Engine Throttle Pull, Engine Throttle Hold, Engine Choke Pull, Engine Choke Hold

Possible Causes: 4.1.10

2.87 HOURMETER SHORT TO BATTERY

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the hourmeter output may be shorted to battery or another function

(Open Circuit and Short to Ground detection are disabled since they cannot be detected reliably with this style load)

All Functions Operable

Possible Causes: Short in Brn/Wht 47-7-1, Short in Brn/Wht 47-7, 4.1.24, 4.1.10

2.88 JIB DOWN SOLENOID OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Jib Down PWM output may be disconnected or the solenoid may be defective.

T500J MODELS ONLY

Functions Disabled: Jib Down

Step	Pretest Instructions	Test	Result	Corrective Action
2.88.1	Short X056.1.soc to X056.2.soc	Is the fault removed?	Yes No	Repair/Replace solenoid Go to step 2.88.2
2.88.2	Short X055.11.pin to X055.12.pin	Is the fault removed?	Yes No	Yel/Blk or Brn/Blk boom wire broken between X055 and X056. Repair or replace Go to step 2.88.3
2.88.3	Short X019.11.soc to X019.12.soc	Is the fault removed?	Yes No	Yel/Blk or Brn/Blk boom wire broken between X019 and X055. Repair or replace Go to step 2.88.4
2.88.4	Short X002.20.pin to B-	Is the fault removed?	Yes No	Blue 28-3-1 or black wire broken between X002 and X019. Repair or replace Possible Causes: 4.1.10

2.89 JIB DOWN SOLENOID SHORT TO BATTERY

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that Lift Down PWM output may be shorted to battery or other function

T500J MODELS ONLY

Functions Disabled: Jib Down

Step	Pretest Instructions	Test	Result	Corrective Action
2.89.1	Disconnect solenoid at X056 and isolate wires	Rerun System Test	Analyzer Message "JIB DOWN VALVE OPEN CIRCUIT" Analyzer Message "JIB DOWN VALVE SHORT TO BATTERY"	Repair/Replace solenoid Go to step 2.89.2
2.89.2	Remove wire Blue 28-3-1 from X002.20	Rerun System Test	Analyzer Message "JIB DOWN VALVE OPEN CIRCUIT" Analyzer Message "JIB DOWN VALVE SHORT TO BATTERY"	Wire Blue 28-3-1 or Yel/Blk boom wire shorted to battery. Repair or replace Possible Cause: 4.1.10

2.90 JIB DOWN SOLENOID SHORT TO GROUND

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that Jib Down PWM output may be shorted to ground or the solenoid may be defective

T500J MODELS ONLY

Functions Disabled: Jib Up

Step	Pretest Instructions	Test	Result	Corrective Action
2.90.1	Disconnect solenoid at X056 and isolate wires	Rerun System Test	Analyzer Message "JIB DOWN VALVE OPEN CIRCUIT" Analyzer Message "JIB DOWN VALVE SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.90.2
2.90.2	Remove wire Blue 28-3-1 from X002.20	Rerun System Test	Analyzer Message "JIB DOWN VALVE OPEN CIRCUIT" Analyzer Message "JIB DOWN VALVE SHORT TO GROUND"	Wire Blue 28-3-1 or Blue 28-3 shorted to ground. Repair or replace Possible Cause: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.91 JIB UP SOLENOID OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Jib Up digital output may be disconnected or the solenoid may be defective.

T500J MODELS ONLY

Functions Disabled: Jib Up

Step	Pretest Instructions	Test	Result	Corrective Action
2.91.1	Run system test	Do other functions fail system test?	Yes No	Possible Causes: Black ground wire from X002.14 broken, 4.1.1 otherwise Go to step 2.91.2 Go to step 2.91.3
2.91.2	Disconnect solenoid. Short X079.1.soc to X079.2.soc	Rerun System Test	Analyzer Message "JIB UP VALVE SHORT TO GROUND" Analyzer Message "JIB UP VALVE OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.91.3
2.91.3	Replace X002.12 with a jumper to X002.14	Rerun System Test	Analyzer Message "JIB UP VALVE SHORT TO GROUND" Analyzer Message "JIB UP VALVE OPEN CIRCUIT"	Wire Blue 27-3-1 or Blue 27-3 broken. Repair or replace Possible Cause: 4.1.10

2.92 JIB UP SOLENOID SHORT TO BATTERY

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that Jib Up digital output may be shorted to battery or other function

T500J MODELS ONLY

Functions Disabled: Jib Up

Step	Pretest Instructions	Test	Result	Corrective Action
2.92.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.92.2 Go to step 2.92.2
2.92.2	Disconnect solenoid at X079 and isolate wires	Rerun System Test	Analyzer Message "JIB UP VALVE OPEN CIRCUIT" Analyzer Message "JIB UP VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.92.3
2.92.3	Remove wire Blue 27-3-1 from X002.12	Rerun System Test	Analyzer Message "JIB UP VALVE OPEN CIRCUIT" Analyzer Message "JIB UP VALVE SHORT TO BATTERY"	Wire Blue 27-3-1 or Blue 27-3 shorted to battery. Repair or replace Possible Cause: 4.1.10

2.93 JIB UP SOLENOID SHORT TO GROUND

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that Jib Up digital output may be shorted to ground or the solenoid may be defective

T500J MODELS ONLY

Functions Disabled: Jib Up

Step	Pretest Instructions	Test	Result	Corrective Action
2.93.1	Disconnect solenoid at X079 and isolate wires	Rerun System Test	Analyzer Message "JIB UP VALVE OPEN CIRCUIT"	Repair/Replace solenoid
			Analyzer Message "JIB UP VALVE SHORT TO GROUND"	Go to step 2.93.2
2.93.2	Remove wire Blue 27-3-1 from X002.12	Rerun System Test	Analyzer Message "JIB UP VALVE OPEN CIRCUIT"	Wire Blue 27-3-1 or Blue 27-3 shorted to ground. Repair or replace
			Analyzer Message "JIB UP VALVE SHORT TO GROUND"	Possible Cause: 4.1.10

2.94 JOYSTICK FAULTY - X AXIS WIPER OUT OF RANGE

Distress Lamp: 9

ADE Code: 2-2

The joystick X-axis (side to side when facing the console) wiper signal input is outside the acceptable voltage range. The wiper wire being off, the wiper wire shorted to B+, or the wiper wire shorted to B- (ground) could cause this difficulty

Functions Disabled at Platform Only: Swing Left, Swing Right, Telescope In, Telescope Out, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.94.1		Does the joystick return to the centered position when moved?	Yes No	Go to step 2.94.2 Possible Cause: 4.1.22
2.94.2	Hold the joystick at the left extent. Using the analyzer, navigate to DIAGNOSTICS -> PLATFORM -> X-JOYSTK	Is the X-Joystk Voltage between 0.75 and 2.25 Volts?	Yes No	Go to step 2.94.3 Go to step 2.94.4
2.94.3	Hold the joystick at the right extent. Using the analyzer, navigate to DIAGNOSTICS -> PLATFORM -> X-JOYSTK	Is the X-Joystk Voltage between 2.75 and 4.25 Volts?	Yes No	Possible Cause: 4.1.26, 4.1.23 Go to step 2.94.4
2.94.4	Place key switch in platform position and pull the emergency stop switches.	Measured voltage between X061.1 and X061.2 = 5V?	Yes No	Go to step 2.94.6 Go to step 2.94.5
2.94.5	Disconnect X061. Place key switch in platform position and pull the emergency stop switches.	Measured voltage between X060.5 and X60.7 = 5V?	Yes No	Possible Cause: Short or Open in Yel/Red 2-18 or Black joystick ground, 4.1.22 Possible Cause: 4.1.11
2.94.6	Place key switch in platform position and pull the emergency stop switches.	Measured voltage between X060.6 and X060.7 between 0.75 and 2.25 Volts?	Yes No	Possible Cause: Short or Open in Orn/Red 49-22 Possible Cause: 4.1.22

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.95 JOYSTICK FAULTY - Y AXIS WIPER OUT OF RANGE

Distress Lamp: 9

ADE Code: 2-2

The joystick Y-axis (fore and aft when facing the console) wiper signal input is outside the acceptable voltage range. The wiper wire being off, the wiper wire shorted to B+, or the wiper wire shorted to B- (ground) could cause this difficulty

Functions Disabled at Platform Only: Lift Up, Lift Down, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.95.1		Does the joystick return to the centered position when moved?	Yes No	Go to step 2.95.2 Possible Cause: 4.1.22
2.95.2	Hold the joystick at the forward extent. Using the analyzer, navigate to DIAGNOSTICS -> PLATFORM -> Y-JOYSTK	Is the Y-Joystk Voltage between 0.75 and 2.25 Volts?	Yes No	Go to step 2.95.3 Go to step 2.95.4
2.95.3	Hold the joystick at the rear extent. Using the analyzer, navigate to DIAGNOSTICS -> PLATFORM -> Y-JOYSTK	Is the Y-Joystk Voltage between 2.75 and 4.25 Volts?	Yes No	Possible Cause: 4.1.26, 4.1.23 Go to step 2.95.4
2.95.4	Place key switch in platform position and pull the emergency stop switches.	Measured voltage between X061.1 and X061.2 = 5V?	Yes No	Go to step 2.95.6 Go to step 2.95.5
2.95.5	Disconnect X061. Place key switch in platform position and pull the emergency stop switches.	Measured voltage between X060.5 and X060.7 = 5V?	Yes No	Possible Cause: Short or Open in Yel/Red 2-18 or Black joystick ground, 4.1.22 Possible Cause: 4.1.11
2.95.6	Place key switch in platform position and pull the emergency stop switches.	Measured voltage between X060.8 and X060.7 between 2.75 and 4.25 Volts?	Yes No	Possible Cause: Short or Open in Orn/Red 49-21 Possible Cause: 4.1.22

2.96 JOYSTICK MOVED BUT TRIGGER SWITCH OPEN

Distress Lamp: 1

ADE Code: None

The platform module senses the joystick is out of center, but did not first sense the trigger switch. This could be due to improper operation or a problem with the trigger switch, joystick, or rotary function select switch.

Functions Disabled at Platform Only: Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.96.1		Was the trigger closed before moving the joystick?	Yes No	Go to step 2.96.2 Cycle power and try again
2.96.2		Was the joystick moved out of the center position?	Yes No	Go to step 2.96.3 Possible Cause: 4.1.22
2.96.3	Place key switch in platform position and pull the emergency stop switches. Engage and hold the trigger.	Measured voltage at X061.6 = Vbatt?	Yes No	Go to step 2.96.4 Go to step 2.96.7
2.96.4	Place key switch in the platform position and pull the emergency stop switches. Using the analyzer, navigate to DIAGNOSTICS -> PLAT-FORM	With the rotary select switch in the LIFT/SW position and trigger engaged, does the Diagnostic Message read "LIFT/SWING SEL"?	Yes No	Go to step 2.96.5 Possible Cause: 4.1.18, broken wire Orn/Red 49-28
2.96.5	Place key switch in the platform position and pull the emergency stop switches. Using the analyzer, navigate to DIAGNOSTICS -> PLAT-FORM	With the rotary select switch in the JIB/TELE position and trigger engaged, does the Diagnostic Message read "JIB/TELE SELECT"?	Yes No	Go to step 2.96.6 Possible Cause: 4.1.18, broken wire Orn/Red 49-29
2.96.6	Place key switch in the platform position and pull the emergency stop switches. Using the analyzer, navigate to DIAGNOSTICS -> PLAT-FORM	With the rotary select switch in the LEVEL position and trigger engaged, does the Diagnostic Message read "LEVEL SELECT"?	Yes No	Possible Cause: 4.1.11 Possible Cause: 4.1.18, broken wire Orn/Red 49-27
2.96.7	Place key switch in platform position and pull the emergency stop switches.	Measured voltage at X061.5 = Vbatt?	Yes No	Go to step 2.96.8 Possible Cause: Open in wire Yel/Red 2-19
2.96.8	Disconnect X061. Engage and hold the trigger.	Test for continuity between X061.5.pin and X061.6.pin.	Yes No	Possible Cause: Open in wire Yel/Red 2-17 Possible Causes: 4.1.22

2.97 KEYSWITCH FAULTY

Distress Lamp: 9

ADE Code: 2-1

The Platform and Ground Mode inputs from the keyswitch (Platform:X007.2, Ground:X007.3) are active at the same time. The control system will default to Ground Mode.

Functions Disabled at Platform Only: Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R), Engine Start, Engine Throttle Pull, Engine Throttle Hold, Engine Choke Pull, Engine Choke Hold

Step	Pretest Instructions	Test	Result	Corrective Action
2.97.1	Extract X014.15. Switch Key to Ground Mode and pull the ground emergency stop switch	Is the fault removed?	Yes No	Go to step 2.97.2 Go to step 2.97.3
2.97.2	Extract X014.15. Switch Key to Ground Mode and pull the ground emergency stop switch	Measured voltage at X026.1 = 0V	Yes No	Replace or repair select switch in ground panel Replace or repair Yel/Red 2-4 wire
2.97.3	Find diode at X009 connected to Yel/Red 2-7, Yel/Red 2-44, and Yel/Red 2-9. Disconnect this diode from X009 and the other diode. Switch Key to Ground Mode and pull the ground emergency stop switch	Is the fault removed?	Yes No	Replace the diodes at X009 Go to step 2.97.4
2.97.4	Extract X019.6. Switch Key to Ground Mode and pull the ground emergency stop switch	Is the fault removed?	Yes No	Possible Causes: Short in Yel/Red 2-4 or Orange or Yellow Boom wires Go to step 2.97.5
2.97.5	Extract X007.1. Switch Key to Ground Mode and pull the ground emergency stop switch	Is the fault removed?	Yes No	Possible Causes: Short in Yel/Red 2-44, 4.1.10 Possible Causes: Short in Yel/Red 2-9, 4.1.10

2.98 LEVEL DOWN SOLENOID OPEN CIRCUIT

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Platform Level Down digital output may be disconnected or the solenoid may be defective.

Functions Disabled: Level Down

Step	Pretest Instructions	Test	Result	Corrective Action
2.98.1	Run system test	Do other functions fail system test?	Yes No	Possible Causes: Black ground wire broken, 4.1.1 otherwise Go to step 2.98.2 Go to step 2.98.3
2.98.2	Disconnect solenoid. Short X081.soc1 to X081.2.soc	Rerun System Test	Analyzer Message "LEVEL DOWN VALVE SHORT TO GROUND" Analyzer Message "LEVEL DOWN VALVE OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.98.3
2.98.3	Replace X002.7 with a jumper to X002.14	Rerun System Test	Analyzer Message "LEVEL DOWN VALVE SHORT TO GROUND" Analyzer Message "LEVEL DOWN VALVE OPEN CIRCUIT"	Wire Pink 26-3-1 or Pink 26-3 broken. Repair or replace Possible Cause: 4.1.10

2.99 LEVEL DOWN SOLENOID SHORT TO BATTERY

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that Platform Level Down digital output may be shorted to battery or other function

Functions Disabled: Level Down

Step	Pretest Instructions	Test	Result	Corrective Action
2.99.1	Run system test	Do other functions fail system test?	Yes No	Possible Causes: Black ground wire broken, 4.1.1, otherwise go to step 2.99.2 Go to step 2.99.2
2.99.2	Disconnect solenoid at X081 and isolate wires	Rerun System Test	Analyzer Message "LEVEL DOWN VALVE OPEN CIRCUIT" Analyzer Message "LEVEL DOWN VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.99.3
2.99.3	Remove wire Pink 26-3-1 from X002.7	Rerun System Test	Analyzer Message "LEVEL DOWN VALVE OPEN CIRCUIT" Analyzer Message "LEVEL DOWN VALVE SHORT TO BATTERY"	Wire Pink 26-3-1 or Pink 26-3 shorted to battery. Repair or replace Possible Cause: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.100 LEVEL DOWN SOLENOID SHORT TO GROUND

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that Platform Level Down digital output may be shorted to ground or the solenoid may be defective

Functions Disabled: Level Down

Step	Pretest Instructions	Test	Result	Corrective Action
2.100.1	Disconnect solenoid at X081 and isolate wires	Rerun System Test	Analyzer Message "LEVEL DOWN VALVE SHORT TO GROUND" Analyzer Message "LEVEL DOWN VALVE OPEN CIRCUIT"	Repair/Replace solenoid Go to step 2.100.2
2.100.2	Remove wire Pink 26-3-1 from X002.7	Rerun System Test	Analyzer Message "LEVEL DOWN VALVE OPEN CIRCUIT" Analyzer Message "LEVEL DOWN VALVE SHORT TO GROUND"	Wire Pink 26-3-1 or Pink 26-3 shorted to ground. Repair or replace Possible Cause: 4.1.10

2.101 LEVEL UP SOLENOID OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Platform Level Up digital output may be disconnected or the solenoid may be defective.

Functions Disabled: Level Up

Step	Pretest Instructions	Test	Result	Corrective Action
2.101.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.101.2 Go to step 2.101.2
2.101.2	Short X080.1.soc to X080.2.soc	Rerun System Test	Analyzer Message "LEVEL UP VALVE SHORT TO GROUND" Analyzer Message "LEVEL UP VALVE OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.101.3
2.101.3	Replace X002.5 with a jumper to X002.14	Rerun System Test	Analyzer Message "LEVEL UP VALVE SHORT TO GROUND" Analyzer Message "LEVEL UP VALVE OPEN CIRCUIT"	Wire Pink 25-3-1 or Pink 25-3 broken. Repair or replace Possible Cause: 4.1.10

2.102 LEVEL UP SOLENOID SHORT TO BATTERY

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Platform Level Up digital output may be shorted to battery or other function

Functions Disabled: Level Up

Step	Pretest Instructions	Test	Result	Corrective Action
2.102.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.102.2 Go to step 2.102.2
2.102.2	Disconnect solenoid at X080 and isolate wires	Rerun System Test	Analyzer Message "LEVEL UP VALVE OPEN CIRCUIT" Analyzer Message "LEVEL UP VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.102.3
2.102.3	Remove wire Pink 25-3-1 from X002.5	Rerun System Test	Analyzer Message "LEVEL UP VALVE OPEN CIRCUIT" Analyzer Message "LEVEL UP VALVE SHORT TO BATTERY"	Wire Pink 25-3-1 or Pink 25-3 shorted to battery. Repair or replace Repair/Replace wire Pink 25-3-1

2.103 LEVEL UP SOLENOID SHORT TO GROUND

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Platform Level Up digital output may be shorted to ground or the solenoid may be defective

Functions Disabled: Level Up

Step	Pretest Instructions	Test	Result	Corrective Action
2.103.1	Disconnect solenoid at X080 and isolate wires	Rerun System Test	Analyzer Message "LEVEL UP VALVE OPEN CIRCUIT" Analyzer Message "LEVEL UP VALVE SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.103.2
2.103.2	Remove wire Pink 25-3-1 from X002.5	Rerun System Test	Analyzer Message "LEVEL UP VALVE OPEN CIRCUIT" Analyzer Message "LEVEL UP VALVE SHORT TO GROUND"	Wire Pink 25-3-1 or Pink 25-3 shorted to ground. Repair or replace Possible Cause: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.104 LIFT DOWN PREVENTED - TELE IN FIRST

Distress Lamp: 2

ADE Code: 2-5

The ground module senses the controls in the lift down position, but the boom telescope limit switch is open and RETRIEVAL-A or RETRIEVAL-B are active. While RETRIEVAL-A or RETRIEVAL-B are active, the boom must be completely telescoped in, closing the telescope limit switch, before the boom can be lowered.

Functions Disabled: Lift Down

Step	Pretest Instructions	Test	Result	Corrective Action
2.104.1		Is the boom fully retracted?	Yes No	See 3.15 Telescope Limit Switch Go to step 2.104.2
2.104.2		Is the machine tilted more than 4.5 degrees?	Yes No	Retract the boom before lowering Go to step 2.104.3
2.104.3		Have any outriggers come unset?	Yes No	Retract the boom before lowering Go to step 2.104.4
2.104.4		ANALYZER -> DIAGNOSTICS -> SYSTEM -> TILT >= 4.5 DEG (platform tilt LED illuminated)	Yes No	See 3.16 Tilt Sensor See 3.11 Outrigger Switches - All Set

2.105 LIFT DOWN SOLENOID OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Lift Down PWM output may be disconnected or the solenoid may be defective.

Functions Disabled: Lift Down

Step	Pretest Instructions	Test	Result	Corrective Action
2.105.1	Short X039.1.soc to X039.2.soc	Is the fault removed?	Yes No	Repair/Replace solenoid Go to step 2.105.2
2.105.2	Short X016.1.pin to X016.2.pin	Is the fault removed?	Yes No	Tan 4-3 or black wire broken between X016 and X039. Repair or replace Go to step 2.105.3
2.105.3	Short X002.22.pin to B-	Is the fault removed?	Yes No	Tan 4-3-1 or black wire broken between X002 and X016. Repair or replace Possible Causes: 4.1.10

2.106 LIFT DOWN SOLENOID SHORT TO BATTERY

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that Lift Down PWM output may be shorted to battery or other function

Functions Disabled: Lift Down

Step	Pretest Instructions	Test	Result	Corrective Action
2.106.1	Disconnect solenoid at X039 and isolate wires	Rerun System Test	Analyzer Message "LIFT DOWN VALVE OPEN CIRCUIT" Analyzer Message "LIFT DOWN VALVE SHORT TO BATTERY"	Repair/Replace solenoid Go to step 2.106.2
2.106.2	Remove wire Tan 4-3-1 from X002.22	Rerun System Test	Analyzer Message "LIFT DOWN VALVE OPEN CIRCUIT" Analyzer Message "LIFT DOWN VALVE SHORT TO BATTERY"	Wire Tan 4-3-1 or Tan 4-3 shorted to battery. Repair or replace Possible Cause: 4.1.10

2.107 LIFT DOWN SOLENOID SHORT TO GROUND

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Lift Down PWM output may be shorted to ground or the solenoid may be defective

Functions Disabled: Lift Down

Step	Pretest Instructions	Test	Result	Corrective Action
2.107.1	Disconnect solenoid at X039 and isolate wires	Rerun System Test	Analyzer Message "LIFT DOWN VALVE OPEN CIRCUIT" Analyzer Message "LIFT DOWN VALVE SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.107.2
2.107.2	Remove wire Tan 4-3-1 from X002.22	Rerun System Test	Analyzer Message "LIFT DOWN VALVE OPEN CIRCUIT" Analyzer Message "LIFT DOWN VALVE SHORT TO GROUND"	Wire Tan 4-3-1 or Tan 4-3 shorted to ground. Repair or replace Possible Cause: 4.1.10

2.108 LIFT UP & TELE OUT PREVENTED - TILTED & ABOVE ELEVATION

Distress Lamp: 2 ADE Code: 2-5

The ground module senses the controls in the lift up or tele out position, but RETRIEVAL-A is active. While RETRIEVAL-A is active, the boom cannot be lifted up or telescoped out any further to prevent further destabilization.

Functions Disabled: Lift Up, Telescope Out

Step	Pretest Instructions	Test	Result	Corrective Action
2.108.1		Is the machine tilted more than 4.5 degrees?	Yes No	Retract, lower the boom and level the machine before lifting or telescoping out. Go to step 2.108.2
2.108.2		ANALYZER -> DIAGNOSTICS -> SYSTEM -> TILT >= 4.5 DEG (platform tilt LED illuminated)	Yes No	See 3.16 Tilt Sensor Possible Causes: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.109 LIFT UP & TELE OUT PREVENTED - TILTED, UNSET, & ABOVE ELEVATION

Distress Lamp: 2

ADE Code: 2-5

The ground module senses the controls in the lift up or telescope out position, but RETRIEVAL-B is active with one outrigger unset and the machine elevated and tilted. While RETRIEVAL-B is active, the boom cannot be lifted up or telescoped out any further to prevent further destabilization.

Functions Disabled: Lift Up, Telescope Out

Step	Pretest Instructions	Test	Result	Corrective Action
2.109.1		Is the machine tilted more than 2 degrees?	Yes No	Go to step 2.109.3 Go to step 2.109.2
2.109.2		ANALYZER -> DIAGNOSTICS -> SYSTEM -> TILT >= 2 DEG (platform tilt LED illuminated)	Yes No	See 3.16 Tilt Sensor Possible Causes: 4.1.10
2.109.3		Have any outriggers come unset?	Yes No	Retract, lower the boom and level the machine before lifting or telescoping out. See 3.11 Outrigger Switches - All Set

2.110 LIFT UP & TELE OUT PREVENTED - UNSET & ABOVE ELEVATION

Distress Lamp: 2

ADE Code: 2-5

The ground module senses the controls in the lift up or telescope out position, but RETRIEVAL-B is active with at least two outriggers unset and the machine elevated. While RETRIEVAL-B is active, the boom cannot be lifted up or telescoped out any further to prevent further destabilization.

Functions Disabled: Lift Up, Telescope Out

Step	Pretest Instructions	Test	Result	Corrective Action
2.110.1		Is the boom elevated?	Yes No	Go to step 2.110.2 3.17 Transport Limit Switch
2.110.2		Are any outriggers unset?	Yes No	Retract, lower the boom and level the machine before trying again See 3.11 Outrigger Switches - All Set

2.111 LIFT UP PREVENTED - CHECK OUTRIGGERS

Distress Lamp: 2

ADE Code: 2-5

The ground module senses the control in the lift up position, but the machine is elevated and all four outriggers are unset. If all four outriggers are unset, the control system allows lift up to function up to the elevation switch point for moving the platform to a safe position for boarding. Once the boom lifts beyond the transport switch position, opening the transport switch, lift up is prevented. Lift down will operate at creep speed till back in transport position. Lift down, set the outriggers, and level the machine before attempting to lift beyond the transport switch position.

Functions Disabled: Lift Up

Step	Pretest Instructions	Test	Result	Corrective Action
2.111.1		Is the boom elevated?	Yes No	See 2.110 Lift Up & Tele Out Prevented - Unset & Above Elevation 3.17 Transport Limit Switch

2.112 LIFT UP PREVENTED - LIFT DOWN THEN SET OUTRIGGERS

Distress Lamp: 2

ADE Code: 2-5

The ground module senses the controls in the lift up position, but the platform is stowed and the outriggers are not completely set or stowed. Lift up is prevented until all outriggers are either set or stowed. While outriggers are stowed, functions should only be used for aligning the boom for transport.

Functions Disabled: Lift Up

Step	Pretest Instructions	Test	Result	Corrective Action
2.112.1		Are all outriggers set?	Yes No	See 3.11 Outrigger Switches - All Set Go to step 2.112.2
2.112.2		Are all outriggers stowed?	Yes No	See 3.12 Outrigger Switches - All Stowed Go to step 2.112.3
2.112.3		Are you attempting to align the boom for transport?	Yes No	Stow all outriggers and try again Set all outriggers and try again

2.113 LIFT UP PREVENTED - TILTED

Distress Lamp: 2

ADE Code: 2-5

Lift Up is being attempted while the Platform is Stowed, all four Outriggers are Set, but the vehicle is Tilted.

The ground module senses the controls in the lift up position, the platform is stowed and the outriggers are all set, but the vehicle is tilted. Lift up is prevented until all outriggers are either set or stowed. While outriggers are stowed, functions should only be used for aligning the boom for transport.

Functions Disabled: Lift Up

Step	Pretest Instructions	Test	Result	Corrective Action
2.113.1		Is the machine tilted more than 2 degrees?	Yes No	Level the machine and try again Go to step 2.113.2
2.113.2		Analyzer DIAGNOSTICS -> SYSTEM -> TILT >= 2 DEG (platform tilt LED illuminated)	Yes No	See 3.16 Tilt Sensor Possible Causes: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.114 LIFT UP SOLENOID OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that Lift Up digital output may be disconnected or the solenoid may be defective.

Functions Disabled: Lift Up

Step	Pretest Instructions	Test	Result	Corrective Action
2.114.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.114.2 Go to step 2.114.2
2.114.2	Disconnect solenoid at X084. Short X084.1.soc to X084.2.soc	Rerun System Test	Analyzer Message "LIFT UP VALVE SHORT TO GROUND" Analyzer Message "LIFT UP VALVE OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.114.3
2.114.3	Replace X002.11 with a jumper to X002.14	Rerun System Test	Analyzer Message "LIFT UP VALVE SHORT TO GROUND" Analyzer Message "LIFT UP VALVE OPEN CIRCUIT"	Wire Tan 3-3-1 or Tan 3-3 broken. Repair or replace Possible Cause: 4.1.10

2.115 LIFT UP SOLENOID SHORT TO BATTERY

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that Lift Up digital output may be shorted to battery or other function

Functions Disabled: Lift Up

Step	Pretest Instructions	Test	Result	Corrective Action
2.115.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.115.2 Go to step 2.115.2
2.115.2	Disconnect solenoid at X084 and isolate wires	Rerun System Test	Analyzer Message "LIFT UP VALVE OPEN CIRCUIT" Analyzer Message "LIFT UP VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.115.3
2.115.3	Remove wire Tan 3-3-1 from X002.11	Rerun System Test	Analyzer Message "LIFT UP VALVE OPEN CIRCUIT" Analyzer Message "LIFT UP VALVE SHORT TO BATTERY"	Wire Tan 3-3-1 or Tan 3-3 shorted to battery. Repair or replace Repair/Replace wire Tan 3-3-1

2.116 LIFT UP SOLENOID SHORT TO GROUND

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that Lift Up digital output may be shorted to ground or the solenoid may be defective

Functions Disabled: Lift Up.

Step	Pretest Instructions	Test	Result	Corrective Action
2.116.1	Disconnect solenoid at X084 and isolate wires	Rerun System Test	Analyzer Message "LIFT UP VALVE OPEN CIRCUIT" Analyzer Message "LIFT UP VALVE SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.116.2
2.116.2	Remove wire Tan 3-3-1 from X002.11	Rerun System Test	Analyzer Message "LIFT UP VALVE OPEN CIRCUIT" Analyzer Message "LIFT UP VALVE SHORT TO GROUND"	Wire Tan 3-3-1 or Tan 3-3 shorted to ground. Repair or replace Possible Cause: 4.1.10

2.117 MODEL CHANGED - HYDRAULICS SUSPENDED - CYCLE EMS

Distress Lamp: 2 ADE Code: 2-5

The user changed the Model Selection using the JLG Analyzer. All functions are being prevented until the EMS is cycled.

Functions Disabled: Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R)

2.118 NO CHARGE SYSTEM OUTPUT

Distress Lamp: 3 ADE Code: 4-3

The engine has been running for at least 15 seconds and the battery voltage is still below 11.5V (except when operating Out-riggers).

ENGINE POWERED MACHINES ONLY

Functions Disabled (Electric Powered Machines Only): Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.118.1		Does the electric start work?	Yes No	Possible Cause: 4.1.4, 4.1.3, 4.1.29, 4.1.30 Possible Cause: 4.1.28

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.119 OPEN-CIRCUIT PUMP MOTOR WIRING

Distress Lamp: 9

ADE Code: 7-7

The Power Module detected an error in the Pump Motor Wiring. Check power wiring and re-cycle power to clear difficulty. Alternately, there may be an issue (open field, armature, or brush) with the Motor.

Functions Disabled: Lift Up, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R), Engine Start, Engine Throttle Pull, Engine Throttle Hold, Engine Choke Pull, Engine Choke Hold, Drive

Step	Pretest Instructions	Test	Result	Corrective Action
2.119.1		While operating Lift Up, is the Voltage between X115 and X114 = Vbatt?	Yes No	See Open-Circuit Pump Motor in 3.3 DC Powered Machine - Power Module See 3.3 DC Powered Machine - Power Module

2.120 OPTIONAL GROUND ALARM SHORT TO BATTERY

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the optional ground alarm PWM output may be shorted to battery or another function

All Functions Operable

Step	Pretest Instructions	Test	Result	Corrective Action
2.120.1	Disconnect alarm at X050 and isolate wires	Is the fault removed?	Yes No	Possible Causes: 4.1.25 Go to step 2.120.2
2.120.2	Remove X017.4 from X017	Is the fault removed?	Yes No	Wire Yel/Red 2-13 or black ground wire between X017 and X050 shorted to battery. Repair or replace Go to step 2.120.3
2.120.3	Remove X002.8 from X002	Is the fault removed?	Yes No	Wire Yel/Red 2-13 between X017 and X002 shorted to battery. Repair or replace Possible Causes: 4.1.10

2.121 OPTIONAL GROUND ALARM SHORT TO GROUND

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that optional ground alarm PWM output may be shorted to ground or the solenoid may be defective

All Functions Operable

Step	Pretest Instructions	Test	Result	Corrective Action
2.121.1	Disconnect alarm at X050 and isolate wires	Is the fault removed?	Yes No	Possible Causes: 4.1.25 Go to step 2.121.2
2.121.2	Remove X017.4 from X017	Is the fault removed?	Yes No	Wire Yel/Red 2-13 or black ground wire shorted to ground. Repair or replace Go to step 2.121.3
2.121.3	Remove X002.8 from X002	Is the fault removed?	Yes No	Wire Yel/Red 2-13 shorted to ground. Repair or replace Possible Causes: 4.1.10

2.122 OUTRIGGER STOW PREVENTED - TELE IN FIRST

Distress Lamp: 2 ADE Code: 2-5

The ground module senses the ground panel outrigger switch is in the stow position, but the boom telescope limit switch is open. The boom must be completely telescoped in, closing the telescope limit switch, before the outriggers can be stowed.

Functions Disabled: Stow (Retract O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.122.1		Is the boom fully retracted?	Yes No	See 3.15 Telescope Limit Switch Retract the boom

2.123 OUTRIGGERS PREVENTED - ELEVATED

Distress Lamp: 2 ADE Code: 2-5

The ground module senses the ground panel outrigger switch is in the set or stow position, but the boom transport limit switch is open. The boom must be completely lowered into transport position, closing the transport limit switch, before the outriggers can be moved.

Functions Disabled: Set (Extend O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.123.1		Is the boom fully lowered?	Yes No	See 3.17 Transport Limit Switch Lower the boom

2.124 PLATFORM POSITION DETECTION FAULTY

Distress Lamp: 9 ADE Code: 2-1

The platform console may optionally be plugged into the chassis for use with the material hook. The proper voltages are not being measured at the Platform Position Analog Inputs (X007.7 and X007.8) to determine whether the Platform Console is plugged in at the Platform or Chassis Connectors. X007.7 should be B+ and X007.8 should be GND when the Platform Console is plugged into the Platform Connector. X007.7 should be GND and X007.8 should be B+ when the Platform Console is plugged into the Chassis Connector. If this difficulty is present, examine wiring at the connectors leading to the pins on the Ground Module and wiring within the Platform Console.

Functions in Creep Mode: Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out

Step	Pretest Instructions	Test	Result	Corrective Action
2.124.1	With the console in the platform position, pull the ground and platform emergency stop switches and place key switch in the platform position	Is the voltage on X019.10 = VBatt?	Yes No	Go to step 2.124.2 Go to step 2.124.6
2.124.2	Remove X019.9. With the console in the platform position, pull the ground and platform emergency stop switches and place key switch in the platform position	Is the voltage on X019.9.pin = VBatt?	Yes No	Go to step 2.124.3 Possible Cause: Orn/Red 49-9 shorted, 4.1.31, 4.1.10
2.124.3	Remove X054.9. With the console in the platform position, pull the ground and platform emergency stop switches and place key switch in the platform position	Is the voltage on X054.9.soc = VBatt?	Yes No	Go to step 2.124.4 Possible Cause: Shorted Blu/Blk between X054 and X019

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

Step	Pretest Instructions	Test	Result	Corrective Action
2.124.4	Remove X058.J. With the console in the platform position, pull the ground and platform emergency stop switches and place key switch in the platform position	Is the voltage on X058.J.soc = VBatt?	Yes No	Go to step 2.124.5 Possible Cause: Shorted Blu/Blk between X058 and X054
2.124.5	Remove X059.J. With the console in the platform position, pull the ground and platform emergency stop switches and place key switch in the platform position	Is the voltage on X059.J.soc = VBatt?	Yes No	Possible Cause: Shorted Blu/Blk between X059.J and X059.H Possible Cause: Shorted Blu/Blk between X059 and X058
2.124.6	With the console in the platform position, pull the ground and platform emergency stop switches and place key switch in the platform position	Is the voltage on X054.9 = VBatt?	Yes No	Possible Cause: Broken Orn/Blk wire between X054 and X019 Go to step 2.124.7
2.124.7	With the console in the platform position, pull the ground and platform emergency stop switches and place key switch in the platform position	Is the voltage on X058.K = VBatt?	Yes No	Possible Cause: Broken Orn/Blk wire between X058 and X054 Go to step 2.124.8
2.124.8	With the console in the platform position, pull the ground and platform emergency stop switches and place key switch in the platform position	Is the voltage on X059.K = VBatt?	Yes No	Possible Cause: Broken Orn/Blk wire between X059 and X058 Possible Cause: Broken Orn/Blk wire between X059.K and X059.D, or see 3.13 Platform Module - Power

2.125 POWER MODULE FAILURE: CHECK POWER CIRCUITS OR MOSFET SHORT CIRCUIT

Distress Lamp: 9

ADE Code: 9-9

The Power Module detected an error in the Power Wiring for the Pump. Alternately, the Power Module has failed a self-test. Check wiring and motor or replace the Power Module. Re-cycle power to clear difficulty.

3 Flashes on Power Module may indicate a Short-Circuit in the Armature Wiring or a faulty Power Module

No Flashes on Power Module may indicate a faulty Power Module

Functions Disabled (Electric Powered Machines Only): Lift Up, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R)

Check all power wiring, see Power Module Electrical Evaluation and Pump Motor Electrical Evaluation in 3.3 DC Powered Machine - Power Module.

Possible Cause: Pump Wiring Shorted, 4.1.39, 4.1.12

2.126 POWER MODULE FAILURE: INTERNAL ERROR

Distress Lamp: 9

ADE Code: 9-9

The Power Module detected an internal error. Alternately, the Power Module has failed a self-test. Check all power wiring, see Power Module Electrical Evaluation and Pump Motor Electrical Evaluation in 3.3 DC Powered Machine - Power Module. Re-cycle power to clear difficulty.

Functions Disabled (Electric Powered Machines Only): Lift Up, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R)

Possible Causes: Line Contactor solenoid is Open-Circuit in Power Module's prior to V1.10, a Power Wiring Issue, 4.1.12

2.127 POWER MODULE FAILURE: PERSONALITY RANGE ERROR

Distress Lamp: 9 ADE Code: 9-9

The Power Module detected an out-of-range or corrupt personality setting. Reset control system Personalities to default settings to clear difficulty. Enter Access Level 1 on the JLG Analyzer, re-select Model, and cycle EMS after 5 seconds. May indicate a Power Module issue if it cannot be reset. Reference 3.3 DC Powered Machine - Power Module.

Functions Disabled (Electric Powered Machines Only): Lift Up, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R)

Possible Causes: Personality setting out of range, 4.1.12

2.128 POWER MODULE TOO HOT - PLEASE WAIT

Distress Lamp: 4 ADE Code: 4-2

The Power Module has reached thermal cutout. Allow to cool by powering down. May indicate that the vehicle is operating in extremely high ambient temperatures, or a faulty Power Module. Reference 3.3 DC Powered Machine - Power Module.

Functions Disabled (Electric Powered Machines Only): Lift Up, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R)

Possible Causes: High operating temperature, 4.1.12

2.129 REAR-LEFT O/R SOLENOID OPEN CIRCUIT

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Rear Left Outrigger digital output may be disconnected or the solenoid may be defective.

Functions Disabled: Rear Left O/R

Step	Pretest Instructions	Test	Result	Corrective Action
2.129.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.129.2 Go to step 2.129.2
2.129.2	Disconnect solenoid at X048. Short X048.1.soc to X048.2.soc	Rerun System Test	Analyzer Message "R-L OUTRIGGER VALVE SHORT TO GROUND" Analyzer Message "R-L OUTRIGGER VALVE OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.129.3
2.129.3	Replace X003.8 with a jumper to X003.3	Rerun System Test	Analyzer Message "R-L OUTRIGGER VALVE SHORT TO GROUND" Analyzer Message "R-L OUTRIGGER VALVE OPEN CIRCUIT"	Wire Orn/Red 49-7 or White wire between X020 and X048 broken. Repair or replace Possible Cause: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.130 REAR-LEFT O/R SOLENOID SHORT TO BATTERY

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Rear Left Outrigger digital output may be shorted to battery or other function

Functions Disabled: Rear Left O/R

Step	Pretest Instructions	Test	Result	Corrective Action
2.130.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black Ground wire broken, 4.1.1, otherwise go to step 2.130.2 Go to step 2.130.2
2.130.2	Disconnect solenoid at X048 and isolate wires	Rerun System Test	Analyzer Message "R-L OUTRIGGER VALVE OPEN CIRCUIT" Analyzer Message "R-L OUTRIGGER VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.130.3
2.130.3	Remove wire Orn/Red 49-7 from X003.8	Rerun System Test	Analyzer Message "R-L OUTRIGGER VALVE OPEN CIRCUIT" Analyzer Message "R-L OUTRIGGER VALVE SHORT TO BATTERY"	Wire Orn/Red 49-7 or White wire between X020 and X048 shorted to battery. Repair or replace Repair/Replace wire Orn/Red 49-7

2.131 REAR-LEFT O/R SOLENOID SHORT TO GROUND

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Rear Left Outrigger digital output may be shorted to ground or the solenoid may be defective

Functions Disabled: Rear Left O/R

Step	Pretest Instructions	Test	Result	Corrective Action
2.131.1	Disconnect solenoid at X048 and isolate wires	Rerun System Test	Analyzer Message "R-L OUTRIGGER VALVE OPEN CIRCUIT" Analyzer Message "R-L OUTRIGGER VALVE SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.131.2
2.131.2	Remove wire Orn/Red 49-7 from X003.8	Rerun System Test	Analyzer Message "R-L OUTRIGGER VALVE OPEN CIRCUIT" Analyzer Message "R-L OUTRIGGER VALVE SHORT TO GROUND"	Wire Orn/Red 49-7 or White wire between X020 and X048 shorted to ground. Repair or replace Possible Cause: 4.1.10

2.132 REAR-RIGHT O/R SOLENOID OPEN CIRCUIT

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Rear Right Outrigger digital output may be disconnected or the solenoid may be defective.

Functions Disabled: Rear Right O/R

Step	Pretest Instructions	Test	Result	Corrective Action
2.132.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.132.2 Go to step 2.132.2
2.132.2	Disconnect solenoid at X049. Short X049.1.soc to X049.2.soc	Rerun System Test	Analyzer Message "R-R OUTRIGGER VALVE SHORT TO GROUND" Analyzer Message "R-R OUTRIGGER VALVE OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.132.3
2.132.3	Replace X003.10 with a jumper to X003.3	Rerun System Test	Analyzer Message "R-R OUTRIGGER VALVE SHORT TO GROUND" Analyzer Message "R-R OUTRIGGER VALVE OPEN CIRCUIT"	Wire Orn/Red 49-8 or White wire between X020 and X049 broken. Repair or replace Possible Cause: 4.1.10

2.133 REAR-RIGHT O/R SOLENOID SHORT TO BATTERY

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Rear Right Outrigger digital output may be shorted to battery or other function

Functions Disabled: Rear Right O/R

Step	Pretest Instructions	Test	Result	Corrective Action
2.133.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.133.2 Go to step 2.133.2
2.133.2	Disconnect solenoid at X049 and isolate wires	Rerun System Test	Analyzer Message "R-R OUTRIGGER VALVE OPEN CIRCUIT" Analyzer Message "R-R OUTRIGGER VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.133.3
2.133.3	Remove wire Orn/Red 49-8 from X003.10	Rerun System Test	Analyzer Message "R-R OUTRIGGER VALVE OPEN CIRCUIT" Analyzer Message "R-R OUTRIGGER VALVE SHORT TO BATTERY"	Wire Orn/Red 49-8 or White wire between X020 and X049 shorted to battery. Repair or replace Repair/Replace wire Orn/Red 49-8

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.134 REAR-RIGHT O/R SOLENOID SHORT TO GROUND

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Rear Right Outrigger digital output may be shorted to ground or the solenoid may be defective

Functions Disabled: Rear Right O/R

Step	Pretest Instructions	Test	Result	Corrective Action
2.134.1	Disconnect solenoid at X049 and isolate wires	Rerun System Test	Analyzer Message "R-R OUTRIGGER VALVE OPEN CIRCUIT" Analyzer Message "R-R OUTRIGGER VALVE SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.134.2
2.134.2	Remove wire Orn/Red 49-8 from X003.10	Rerun System Test	Analyzer Message "R-R OUTRIGGER VALVE OPEN CIRCUIT" Analyzer Message "R-R OUTRIGGER VALVE SHORT TO GROUND"	Wire Orn/Red 49-8 or White wire between X020 and X049 shorted to ground. Repair or replace Possible Cause: 4.1.10

2.135 RETRACT O/R SOLENOID OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Retract (Stow) Outriggers digital output may be disconnected or the solenoid may be defective.

Functions Disabled: Stow (Retract O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.135.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.135.2 Go to step 2.135.2
2.135.2	Disconnect solenoid at X085. Short X085.1.soc to X085.2.soc	Rerun System Test	Analyzer Message "RETRACT VALVE SHORT TO GROUND" Analyzer Message "RETRACT VALVE OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.135.3
2.135.3	Replace X003.14 with a jumper to X003.3	Rerun System Test	Analyzer Message "RETRACT VALVE SHORT TO GROUND" Analyzer Message "RETRACT VALVE OPEN CIRCUIT"	Wire Orn/Wht 55-4-1 or Orn/Wht 55-4 broken. Repair or replace Possible Cause: 4.1.10

2.136 RETRACT O/R SOLENOID SHORT TO BATTERY

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Retract (Stow) Outriggers digital output may be shorted to battery or other function

Functions Disabled: Stow (Retract O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.136.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.136.2 Go to step 2.136.2
2.136.2	Disconnect solenoid at X085 and isolate wires	Rerun System Test	Analyzer Message "RETRACT VALVE OPEN CIRCUIT" Analyzer Message "RETRACT VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.136.3
2.136.3	Remove wire Orn/Wht 55-4-1 from X003.14	Rerun System Test	Analyzer Message "RETRACT VALVE OPEN CIRCUIT" Analyzer Message "RETRACT VALVE SHORT TO BATTERY"	Wire Orn/Wht 55-4-1 or Orn/Wht 55-4 shorted to battery. Repair or replace Repair/Replace wire Orn/Wht 55-4-1

2.137 RETRACT O/R SOLENOID SHORT TO GROUND

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Retract (Stow) Outriggers digital output may be shorted to ground or the solenoid may be defective

Functions Disabled: Stow (Retract O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.137.1	Disconnect solenoid at X085 and isolate wires	Rerun System Test	Analyzer Message "RETRACT VALVE OPEN CIRCUIT" Analyzer Message "RETRACT VALVE SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.137.2
2.137.2	Remove wire Orn/Wht 55-4-1 from X003.14	Rerun System Test	Analyzer Message "RETRACT VALVE OPEN CIRCUIT" Analyzer Message "RETRACT VALVE SHORT TO GROUND"	Wire Orn/Wht 55-4-1 or Orn/Wht 55-4 shorted to ground. Repair or replace Possible Cause: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.138 RUNNING AT CREEP - MATERIAL HOOK MODE

Distress Lamp: None ADE Code: None

All function speeds are limited to creep because at the vehicle is being operated in Ground Mode while the Material Hook is in use.

Functions in Creep Mode: Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out

Step	Pretest Instructions	Test	Result	Corrective Action
2.138.1		Is the platform console plugged into the optional material hook harness?	Yes No	Go to step 2.138.2 See 2.124 Platform Position Detection Faulty
2.138.2		Is the key switch turned to the platform position?	Yes No	Turn the key to platform position for material hook operation with the platform console Possible Causes: Faulty keyswitch wiring, See 2.97 Keyswitch Faulty, 4.1.10

2.139 RUNNING AT CREEP - TILTED & ABOVE ELEVATION

Distress Lamp: 2 ADE Code: None

All function speeds are limited to creep because the vehicle is tilted and the platform is elevated.

Functions in Creep Mode: Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out

Step	Pretest Instructions	Test	Result	Corrective Action
2.139.1		Is the platform elevated?	Yes No	Go to step 2.139.2 See 3.17 Transport Limit Switch
2.139.2		Is the machine tilted more than 2 degrees?	Yes No	The machine will operate at lower speed while tilted and elevated Go to step 2.139.3
2.139.3		ANALYZER -> DIAGNOSTICS -> SYSTEM -> TILT > = 2 DEG (platform tilt LED illuminated)	Yes No	See 3.16 Tilt Sensor Possible Causes: 4.1.10

2.140 RUNNING AT CREEP - UNSET & ABOVE ELEVATION

Distress Lamp: 2 ADE Code: None

All function speeds are limited to creep because the outriggers are not completely set and the platform is elevated.

Functions in Creep Mode: Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out

Step	Pretest Instructions	Test	Result	Corrective Action
2.140.1		Is the platform elevated?	Yes No	Go to step 2.140.2 See 3.17 Transport Limit Switch
2.140.2		Are any outriggers unset?	Yes No	Retract, lower the boom and level the machine before trying again See 3.11 Outrigger Switches - All Set

2.141 START SOLENOID OPEN CIRCUIT

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Engine Start digital output may be disconnected or the solenoid may be defective. The start solenoid fuse should be checked.

ENGINE POWERED MODELS ONLY

Functions Disabled (Engine Powered Machines Only): Engine Start

Step	Pretest Instructions	Test	Result	Corrective Action
2.141.1		Is the start solenoid fuse at X088 blown?	Yes No	Replace the fuse Go to step 2.141.2
2.141.2	Disconnect solenoid at X089. On harness end, short X089 to B-	Rerun System Test	Analyzer Message "START SOLENOID SHORT TO GROUND" Analyzer Message "START SOLENOID OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.141.3
2.141.3	Replace X002.23 with a jumper to X002.14	Rerun System Test	Analyzer Message "START SOLENOID SHORT TO GROUND" Analyzer Message "START SOLENOID OPEN CIRCUIT"	Wire Wht/Yel 48-6 or wire between X022 and X089 broken. Repair or replace Possible Cause: 4.1.10

2.142 START SOLENOID SHORT TO BATTERY

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Engine Start digital output may be shorted to battery or other function.

Functions Disabled (Engine Powered Machines Only): Engine Start

Step	Pretest Instructions	Test	Result	Corrective Action
2.142.1	Disconnect solenoid at X089 and isolate wires	Rerun System Test	Analyzer Message "START SOLENOID OPEN CIRCUIT" Analyzer Message "START SOLENOID SHORT TO BATTERY"	Replace solenoid Go to step 2.142.2
2.142.2	Remove wire Wht/Yel 48-6 from X002.23	Rerun System Test	Analyzer Message "START SOLENOID OPEN CIRCUIT" Analyzer Message "START SOLENOID SHORT TO BATTERY"	Wire Wht/Yel 48-6 or wire between X022 and X089 shorted to battery. Repair or replace Possible Cause: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.143 START SOLENOID SHORT TO GROUND

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Engine Start digital output may be shorted to ground or the solenoid may be defective

Functions Disabled (Engine Powered Machines Only): Engine Start

Step	Pretest Instructions	Test	Result	Corrective Action
2.143.1	Disconnect solenoid at X089 and isolate wires	Rerun System Test	Analyzer Message "START SOLENOID OPEN CIRCUIT" Analyzer Message "START SOLENOID SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.143.2
2.143.2	Remove wire Wht/Yel 48-6 from X002.23	Rerun System Test	Analyzer Message "START SOLENOID OPEN CIRCUIT" Analyzer Message "START SOLENOID SHORT TO GROUND"	Wire Wht/Yel 48-6 or wire between X022 and X089 shorted to ground. Repair or replace Possible Cause: 4.1.10

2.144 SWING LEFT SOLENOID OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Swing Left digital output may be disconnected or the solenoid may be defective. The start solenoid fuse should be checked.

Functions Disabled: Swing Left

Step	Pretest Instructions	Test	Result	Corrective Action
2.144.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.144.2 Go to step 2.144.2
2.144.2	Disconnect solenoid. Short X077.1.soc to X077.2.soc	Rerun System Test	Analyzer Message "SWING LEFT VALVE SHORT TO GROUND" Analyzer Message "SWING LEFT VALVE OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.144.3
2.144.3	Replace X002.34 with a jumper to X002.14	Rerun System Test	Analyzer Message "SWING LEFT VALVE SHORT TO GROUND" Analyzer Message "SWING LEFT VALVE OPEN CIRCUIT"	Wire White 21-3-1 or White 21-3 broken. Repair or replace Possible Cause: 4.1.10

2.145 SWING LEFT SOLENOID SHORT TO BATTERY

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Swing Left digital output may be shorted to battery or other function.

Functions Disabled: Swing Left

Step	Pretest Instructions	Test	Result	Corrective Action
2.145.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.145.2 Go to step 2.145.2
2.145.2	Disconnect solenoid at X077	Rerun System Test	Analyzer Message "SWING LEFT VALVE OPEN CIRCUIT" Analyzer Message "SWING LEFT VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.145.3
2.145.3	Remove wire White 21-3-1 from X002.34	Rerun System Test	Analyzer Message "SWING LEFT VALVE OPEN CIRCUIT" Analyzer Message "SWING LEFT VALVE SHORT TO BATTERY"	Wire White 21-3-1 or White 21-3 shorted to battery. Repair or replace Possible Cause: 4.1.10

2.146 SWING LEFT SOLENOID SHORT TO GROUND

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Swing Left digital output may be shorted to ground or the solenoid may be defective

Functions Disabled: Swing Left

Step	Pretest Instructions	Test	Result	Corrective Action
2.146.1	Disconnect solenoid at X077	Rerun System Test	Analyzer Message "SWING LEFT VALVE OPEN CIRCUIT" Analyzer Message "SWING LEFT VALVE SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.146.2
2.146.2	Remove wire White 21-3-1 from X002.34	Rerun System Test	Analyzer Message "SWING LEFT VALVE OPEN CIRCUIT" Analyzer Message "SWING LEFT VALVE SHORT TO GROUND"	Wire White 21-3-1 or White 21-3 shorted to ground. Repair or replace Possible Cause: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.147 SWING RIGHT SOLENOID OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Swing Right digital output may be disconnected or the solenoid may be defective. The start solenoid fuse should be checked.

Functions Disabled: Swing Right

Step	Pretest Instructions	Test	Result	Corrective Action
2.147.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.147.2 Go to step 2.147.2
2.147.2	Disconnect solenoid. Short X078.1.soc to X078.2.soc	Rerun System Test	Analyzer Message "SWING RIGHT VALVE SHORT TO GROUND" Analyzer Message "SWING RIGHT VALVE OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.147.3
2.147.3	Replace X002.35 with a jumper to X002.14	Rerun System Test	Analyzer Message "SWING RIGHT VALVE SHORT TO GROUND" Analyzer Message "SWING RIGHT VALVE OPEN CIRCUIT"	Wire White 22-3-1 or White 22-3 broken. Repair or replace Possible Cause: 4.1.10

2.148 SWING RIGHT SOLENOID SHORT TO BATTERY

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Swing Right digital output may be shorted to battery or other function.

Functions Disabled: Swing Right

Step	Pretest Instructions	Test	Result	Corrective Action
2.148.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.148.2 Go to step 2.148.2
2.148.2	Disconnect solenoid at X078	Rerun System Test	Analyzer Message "SWING RIGHT VALVE OPEN CIRCUIT" Analyzer Message "SWING RIGHT VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.148.3
2.148.3	Remove wire White 22-3-1 from X002.35	Rerun System Test	Analyzer Message "SWING RIGHT VALVE OPEN CIRCUIT" Analyzer Message "SWING RIGHT VALVE SHORT TO BATTERY"	Wire White 22-3-1 or White 22-3 shorted to battery. Repair or replace Possible Cause: 4.1.10

2.149 SWING RIGHT SOLENOID SHORT TO GROUND

Distress Lamp: 9 ADE Code: 3-3

Ground module feedback shows that the Swing Right digital output may be shorted to ground or the solenoid may be defective

Functions Disabled: Swing Right

Step	Pretest Instructions	Test	Result	Corrective Action
2.149.1	Disconnect solenoid at X078	Rerun System Test	Analyzer Message "SWING RIGHT VALVE OPEN CIRCUIT" Analyzer Message "SWING RIGHT VALVE SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.149.2
2.149.2	Remove wire White 22-3-1 from X002.35	Rerun System Test	Analyzer Message "SWING RIGHT VALVE OPEN CIRCUIT" Analyzer Message "SWING RIGHT VALVE SHORT TO GROUND"	Wire White 22-3-1 or White 22-3 shorted to ground. Repair or replace Possible Cause: 4.1.10

2.150 TELE OUT PREVENTED - SET OUTRIGGERS

Distress Lamp: 2 ADE Code: 2-5

The ground module senses the controls in the telescope out position while the Platform is Stowed, but the vehicle's Outriggers are improperly set. Telescope Out is prevented until all outriggers are set.

Functions Disabled: Telescope Out

Step	Pretest Instructions	Test	Result	Corrective Action
2.150.1		Is the boom elevated?	Yes No	3.17 Transport Limit Switch Go to step 2.150.2
2.150.2		Are any outriggers unset?	Yes No	Level the machine before trying again See 3.11 Outrigger Switches - All Set

2.151 TELE OUT PREVENTED - TILTED

Distress Lamp: 2 ADE Code: 2-5

The ground module senses the controls in the telescope out position, the platform is stowed, but the vehicle is tilted.

Functions Disabled: Telescope Out

Step	Pretest Instructions	Test	Result	Corrective Action
2.151.1		Is the machine tilted more than 2 degrees?	Yes No	Level the machine and try again Go to step 2.113.2
2.151.2		Analyzer DIAGNOSTICS -> SYSTEM -> TILT >= 2 DEG (platform tilt LED illuminated)	Yes No	See 3.16 Tilt Sensor Possible Causes: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.152 TELESCOPE IN SOLENOID OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Telescope In digital output may be disconnected or the solenoid may be defective. The start solenoid fuse should be checked.

Functions Disabled: Telescope In

Step	Pretest Instructions	Test	Result	Corrective Action
2.152.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.152.2 Go to step 2.152.2
2.152.2	Disconnect solenoid. Short X083.1.soc to X083.2.soc	Rerun System Test	Analyzer Message "TELESCOPE IN VALVE SHORT TO GROUND" Analyzer Message "TELESCOPE IN VALVE OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.152.3
2.152.3	Replace X002.4 with a jumper to X002.14	Rerun System Test	Analyzer Message "TELESCOPE IN VALVE SHORT TO GROUND" Analyzer Message "TELESCOPE IN VALVE OPEN CIRCUIT"	Wire Brown 13-3-1 or Brown 13-3 broken. Repair or replace Possible Cause: 4.1.10

2.153 TELESCOPE IN SOLENOID SHORT TO BATTERY

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Telescope In digital output may be shorted to battery or other function.

Functions Disabled: Telescope In

Step	Pretest Instructions	Test	Result	Corrective Action
2.153.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.153.2 Go to step 2.153.2
2.153.2	Disconnect solenoid at X083	Rerun System Test	Analyzer Message "TELESCOPE IN VALVE OPEN CIRCUIT" Analyzer Message "TELESCOPE IN VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.153.3
2.153.3	Remove wire Brown 13-3-1 from X002.4	Rerun System Test	Analyzer Message "TELESCOPE IN VALVE OPEN CIRCUIT" Analyzer Message "TELESCOPE IN VALVE SHORT TO BATTERY"	Wire Brown 13-3-1 or Brown 13-3 shorted to battery. Repair or replace Possible Cause: 4.1.10

2.154 TELESCOPE IN SOLENOID SHORT TO GROUND

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Telescope In digital output may be shorted to ground or the solenoid may be defective.

Functions Disabled: Telescope In

Step	Pretest Instructions	Test	Result	Corrective Action
2.154.1	Disconnect solenoid at X083	Rerun System Test	Analyzer Message "TELESCOPE IN VALVE OPEN CIRCUIT" Analyzer Message "TELESCOPE IN VALVE SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.154.2
2.154.2	Remove wire Brown 13-3-1 from X002.4	Rerun System Test	Analyzer Message "TELESCOPE IN VALVE OPEN CIRCUIT" Analyzer Message "TELESCOPE IN VALVE SHORT TO GROUND"	Wire Brown 13-3-1 or Brown 13-3 shorted to ground. Repair or replace Possible Cause: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.155 TELESCOPE OUT SOLENOID OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Telescope Out digital output may be disconnected or the solenoid may be defective.

Functions Disabled: Telescope Out

Step	Pretest Instructions	Test	Result	Corrective Action
2.155.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.155.2 Go to step 2.155.2
2.155.2	Disconnect solenoid. Short X082.1.soc to X082.2.soc	Rerun System Test	Analyzer Message "TELESCOPE OUT VALVE SHORT TO GROUND" Analyzer Message "TELESCOPE OUT VALVE OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.155.3
2.155.3	Replace X002.16 with a jumper to X002.14	Rerun System Test	Analyzer Message "TELESCOPE OUT VALVE SHORT TO GROUND" Analyzer Message "TELESCOPE OUT VALVE OPEN CIRCUIT"	Wire Brown 14-3-1 or Brown 14-3 broken. Repair or replace Possible Cause: 4.1.10

2.156 TELESCOPE OUT SOLENOID SHORT TO BATTERY

Distress Lamp: 9

ADE Code: 3-3

Telescope Out digital output may be shorted to battery or other function.

Functions Disabled: Telescope Out

Step	Pretest Instructions	Test	Result	Corrective Action
2.156.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: Black ground wire broken, 4.1.1, otherwise go to step 2.156.2 Go to step 2.156.2
2.156.2	Disconnect solenoid at X082	Rerun System Test	Analyzer Message "TELESCOPE OUT VALVE OPEN CIRCUIT" Analyzer Message "TELESCOPE OUT VALVE SHORT TO BATTERY"	Replace solenoid Go to step 2.156.3
2.156.3	Remove wire Brown 14-3-1 from X002.16	Rerun System Test	Analyzer Message "TELESCOPE OUT VALVE OPEN CIRCUIT" Analyzer Message "TELESCOPE OUT VALVE SHORT TO BATTERY"	Wire Brown 14-3-1 or Brown 14-3 shorted to battery. Repair or replace Possible Cause: 4.1.10

2.157 TELESCOPE OUT SOLENOID SHORT TO GROUND

Distress Lamp: 9

ADE Code: 3-3

Telescope Out digital output may be shorted to ground or solenoid may be defective.

Functions Disabled: Telescope Out.

Step	Pretest Instructions	Test	Result	Corrective Action
2.157.1	Disconnect solenoid at X082	Rerun System Test	Analyzer Message "TELESCOPE OUT VALVE OPEN CIRCUIT" Analyzer Message "TELESCOPE OUT VALVE SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.157.2
2.157.2	Remove wire Brown 14-3-1 from X002.16	Rerun System Test	Analyzer Message "TELESCOPE OUT VALVE OPEN CIRCUIT" Analyzer Message "TELESCOPE OUT VALVE SHORT TO GROUND"	Wire Brown 14-3-1 or Brown 14-3 shorted to ground. Repair or replace Possible Cause: 4.1.10

2.158 THROTTLE HOLD SOLENOID OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Engine Throttle Hold digital output may be disconnected from solenoid or the solenoid may be defective.

ENGINE POWERED MACHINES ONLY

Functions Disabled (Engine Powered Machines Only): Engine Throttle Hold

Step	Pretest Instructions	Test	Result	Corrective Action
2.158.1	Run system test	Do other functions fail system test?	Yes No	Check: 4.1.15, 4.1.1, otherwise go to step 2.158.2 Go to step 2.158.2
2.158.2	Disconnect solenoid at X097. On harness end, short X097 WHT/YEL 48-3 to X097 BLACK wire	Rerun System Test	Analyzer Message "THROTTLE HOLD SOLENOID SHORT TO GROUND" Analyzer Message "THROTTLE HOLD SOLENOID OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.158.3
2.158.3	Replace X003.11 with a jumper to X003.3	Rerun System Test	Analyzer Message "THROTTLE HOLD SOLENOID SHORT TO GROUND" Analyzer Message "THROTTLE HOLD SOLENOID OPEN CIRCUIT"	Wire WHT/YEL 48-3 broken. Repair or replace Possible Cause: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.159 THROTTLE HOLD SOLENOID SHORT TO BATTERY

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Engine Throttle Hold digital output may be shorted to battery or other function.

ENGINE POWERED MACHINES ONLY

Functions Disabled (Engine Powered Machines Only): Engine Throttle Hold

Step	Pretest Instructions	Test	Result	Corrective Action
2.159.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: 4.1.15, 4.1.1, otherwise go to step 2.159.2 Go to step 2.159.2
2.159.2	Disconnect solenoid at X097 and isolate wires	Rerun System Test	Analyzer Message "THROTTLE HOLD SOLENOID OPEN CIRCUIT" Analyzer Message "THROTTLE HOLD SOLENOID SHORT TO BATTERY"	Replace solenoid Go to step 2.159.3
2.159.3	Remove wire WHT/YEL 48-3 from X003.11	Rerun System Test	Analyzer Message "THROTTLE HOLD SOLENOID OPEN CIRCUIT" Analyzer Message "THROTTLE HOLD SOLENOID SHORT TO BATTERY"	Wire WHT/YEL 48-3 shorted to battery. Repair or replace Possible Cause: 4.1.10

2.160 THROTTLE HOLD SOLENOID SHORT TO GROUND

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Engine Throttle Hold digital output may be shorted to ground or solenoid may be defective.

ENGINE POWERED MACHINES ONLY

Functions Disabled (Engine Powered Machines Only): Engine Throttle Hold

Step	Pretest Instructions	Test	Result	Corrective Action
2.160.1	Disconnect solenoid at X097 and isolate wires	Rerun System Test	Analyzer Message "THROTTLE HOLD SOLENOID OPEN CIRCUIT" Analyzer Message "THROTTLE HOLD SOLENOID SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.160.2
2.160.2	Remove wire WHT/YEL 48-3 from X003.11	Rerun System Test	Analyzer Message "THROTTLE HOLD SOLENOID OPEN CIRCUIT" Analyzer Message "THROTTLE HOLD SOLENOID SHORT TO GROUND"	Wire WHT/YEL 48-3 shorted to ground. Repair or replace Possible Cause: 4.1.10

2.161 THROTTLE PULL RELAY OPEN CIRCUIT

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Engine Throttle Pull digital output may be disconnected from the relay or the relay may be defective.

ENGINE POWERED MACHINES ONLY

Functions Disabled (Engine Powered Machines Only): Engine Throttle Pull

Step	Pretest Instructions	Test	Result	Corrective Action
2.161.1	Run system test	Do other functions fail system test?	Yes No	Check: 4.1.15, 4.1.1, otherwise go to step 2.161.2 Go to step 2.161.2
2.161.2	Disconnect relay at X091. At harness end, short X091.86 WHT/YEL 48-4 to X091.85 BLACK wire	Rerun System Test	Analyzer Message "THROTTLE PULL RELAY SHORT TO GROUND" Analyzer Message "THROTTLE PULL RELAY OPEN CIRCUIT"	Replace solenoid and/or connector Go to step 2.161.3
2.161.3	Replace X003.9 with a jumper to X003.3	Rerun System Test	Analyzer Message "THROTTLE PULL RELAY SHORT TO GROUND" Analyzer Message "THROTTLE PULL RELAY OPEN CIRCUIT"	Wire WHT/YEL 48-2 broken. Repair or replace Possible Cause: 4.1.10

2.162 THROTTLE PULL RELAY SHORT TO BATTERY

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Engine Throttle Pull digital output may be shorted to battery or other function.

ENGINE POWERED MACHINES ONLY

Functions Disabled (Engine Powered Machines Only): Engine Throttle Pull

Step	Pretest Instructions	Test	Result	Corrective Action
2.162.1	Run system test	Do other functions fail system test?	Yes No	Possible Cause: 4.1.15, 4.1.1, otherwise go to step 2.162.2 Go to step 2.162.2
2.162.2	Disconnect relay at X091 and isolate wires	Rerun System Test	Analyzer Message "THROTTLE PULL RELAY OPEN CIRCUIT" Analyzer Message "THROTTLE PULL RELAY SHORT TO BATTERY"	Replace solenoid Go to step 2.162.3
2.162.3	Remove wire WHT/YEL 48-2 from X003.9	Rerun System Test	Analyzer Message "THROTTLE PULL RELAY OPEN CIRCUIT" Analyzer Message "THROTTLE PULL RELAY SHORT TO BATTERY"	Wire WHT/YEL 48-2 shorted to battery. Repair or replace Possible Cause: 4.1.10

SECTION 2 - TROUBLESHOOTING BY FAULT MESSAGES

2.163 THROTTLE PULL RELAY SHORT TO GROUND

Distress Lamp: 9

ADE Code: 3-3

Ground module feedback shows that the Engine Throttle Pull digital output may be shorted to ground or the relay may be defective.

ENGINE POWERED MACHINES ONLY

Functions Disabled (Engine Powered Machines Only): Engine Throttle Pull

Step	Pretest Instructions	Test	Result	Corrective Action
2.163.1	Disconnect solenoid at X091 and isolate wires	Rerun System Test	Analyzer Message "THROTTLE PULL RELAY OPEN CIRCUIT" Analyzer Message "THROTTLE PULL RELAY SHORT TO GROUND"	Repair/Replace solenoid Go to step 2.163.2
2.163.2	Remove wire WHT/YEL 48-2 from X003.9	Rerun System Test	Analyzer Message "THROTTLE PULL RELAY OPEN CIRCUIT" Analyzer Message "THROTTLE PULL RELAY SHORT TO GROUND"	Wire WHT/YEL 48-2 shorted to ground. Repair or replace Possible Cause: 4.1.10

2.164 TRIGGER CLOSED TOO LONG WHILE IN NEUTRAL

Distress Lamp: 1

ADE Code: 2-2

The Trigger Switch in the Platform Control Box was closed for more than seven seconds while the Joystick was in the neutral position (centered). Release switch or repair the switch / wiring to clear the difficulty.

Functions Disabled at Platform Only: Lift Up, Lift Down, Swing Left, Swing Right, Telescope In, Telescope Out, Jib Up, Jib Down, Level Up, Level Down, Front Left O/R, Front Right O/R, Rear Left O/R, Rear Right O/R, Set (Extend O/R), Stow (Retract O/R)

Step	Pretest Instructions	Test	Result	Corrective Action
2.164.1		Was the switch held for more than 7 seconds?	Yes No	Release switch and try again Go to step 2.164.2
2.164.2	Switch Key to Platform Mode and pull the ground and platform emergency stop switches. Turn the select switch to the Lift/Swing Position. Do NOT hold the joystick.	Analyzer DIAGNOSTICS -> PLATFORM ->	"LIFT/SWING SEL" "LEVEL SELECT" "JIB/TELE SELECT" "TRIGGER OPEN"	Possible Cause: 4.1.19, 4.1.18, Shorted Yel/Red2-17, 4.1.22, 4.1.11 See 2.72 Function Problem - Rotary Selector Switch See 2.72 Function Problem - Rotary Selector Switch See 2.72 Function Problem - Rotary Selector Switch

SECTION 3. COMPONENT CHECKS

3.1 DC POWERED MACHINE - HYDRAULIC PUMP

Step	Pretest Instructions	Test	Result	Corrective Action
3.1.1		Voltage between B+ and B- (X102 and X101) = Vbatt?	Yes No	Go to step 3.1.2 See 3.2 DC Powered Machine - Power
3.1.2	Engage enable and lift up switch	Voltage between M1 and M2 (X103 and X104) = Vbatt?	Yes No	Go to step 3.1.3 Possible Causes: 4.1.12
3.1.3	Engage enable and lift up switch	Voltage between X115 and X114 = Vbatt?	Yes No	Possible Causes: 4.1.69 Go to step 3.1.4
3.1.4	Engage enable and lift up switch	Voltage between X115 and X101 = Vbatt?	Yes No	Go to step 3.1.5 Possible Causes: 4.1.70, 4.1.72, 4.1.12
3.1.5	Engage enable and lift up switch	Voltage between X114 and X102 = Vbatt?	Yes No	Possible Causes: 4.1.12 Possible Causes: 4.1.71, 4.1.72, 4.1.12

3.2 DC POWERED MACHINE - POWER

Step	Pretest Instructions	Test	Result	Corrective Action
3.2.1		Disconnect batteries and check for 6V across each battery	less than 6V 6V or greater	Charge or replace batteries Go to step 3.2.2
3.2.2	Disconnect X105	Check for 24V across X105	0V 24V	Repair open in battery cables or terminals Go to step 3.2.3
3.2.3		Measure Voltage across Power Module X102 (B+) and X101 (B-)	0V 24V	Repair open in battery cables or terminals Go to step 3.2.4
3.2.4	Pull the ground emergency stop switch and place key switch in ground position	Check Voltage on X008.2	0V Vbatt	Go to step 3.2.5 Battery Power OK
3.2.5	Pull the ground emergency stop switch and place key switch in ground position	Check Voltage on X009.87	0V Vbatt	See 3.9 Ignition Relay - Power Repair open in YEL/RED 2-8

3.3 DC POWERED MACHINE - POWER MODULE

Theory of Operation

The Power Module is essentially a “low-side” switch for the pump motor. The positive terminal of the pump is tied to Battery Positive after the Line Contactor. The negative terminal of the pump connects to the P Terminal of the Power Module, which switches current through MOSFET transistors to the Battery Negative.

For variable speed pump operation, the MOSFET transistors switch On and Off at high frequencies (16kHz). The Duty Cycle is varied to control the voltage applied to the pump motor. When the MOSFET's spend 50% of the period On and 50% Off,

SECTION 3 - COMPONENT CHECKS

approximately $\frac{1}{2}$ of the available Battery Voltage will be applied to the pump motor. Similarly, the MOSFET are On continuously (100% Duty Cycle) to apply all available Battery Voltage to the pump motor.

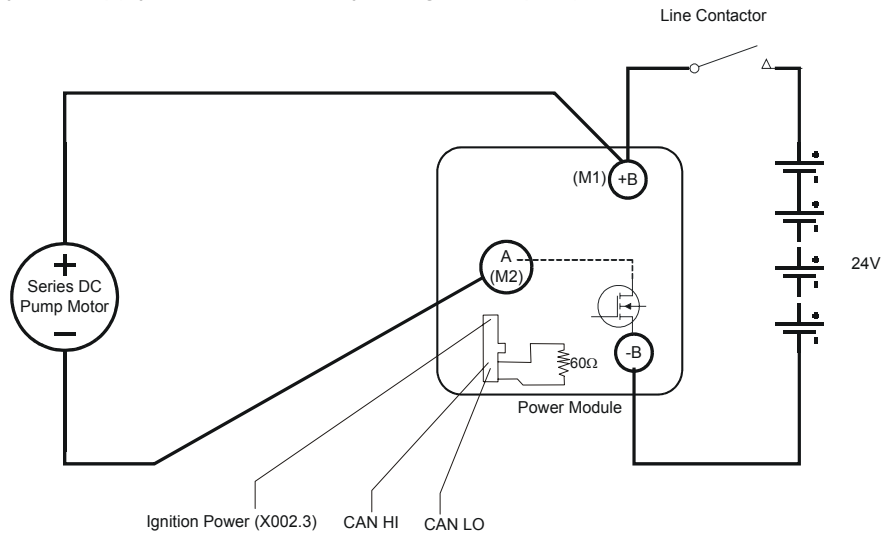


Figure 3-1. Power Module Circuit

When the Control System is energized, the voltage at the P Terminal will be approximately +24V (referenced to B-) when the pump is static. The A (M2) Terminal will be approximately at +1V (referenced to B-) when the pump is running at full speed.

Common Difficulties

The following difficulties can be examined using the JLG Analyzer, a voltmeter, and simple hand tools. Unless otherwise noted, the Control System shall be energized in Ground Mode during testing. The vehicle should be placed on a firm, level surface for all analysis.

Ground Module Interlocks

There are a variety of interlocks that prevent Lift Up due to system events (Tilted, Tilt Sensor Not Calibrated, etc.). Before investigating Pump System issues, examine the JLG Analyzer's HELP Menu while attempting to Lift Up from Ground Mode. Refer to Section 2. Troubleshooting by Fault Messages for explanations of the Help Messages.

Power Module Diagnostic Issues

The Power Module executes a self-test during every power-up to ensure proper functionality. If a Diagnostic Issue is detected, the Power Module will not energize the Line Contactor. Instead, it will flash the Green LED.

Open-Circuit between M1 Terminal and Pump Motor Positive Terminal

This issue will prevent the Pump Motor from operating. Under DIAGNOSTICS -> PUMP, the JLG Analyzer will show PUMP PWM 100% and PUMP CUR 0.0A when Lift Up is operated from Ground Mode.

The voltage measured between the Pump Motor Positive Terminal and Ground Reference should be 24V. If it is not, examine the cable between the terminal and the Power Module compartment. Inspect crimps for corrosion and ensure that bolted connections are tight. Ensure that the cable is not crushed.

Open-Circuit between Pump Motor Negative Terminal and M2 Terminal

This issue will prevent the Pump Motor from operating. Under DIAGNOSTICS -> PUMP, the JLG Analyzer will show PUMP PWM 100% and PUMP CUR 0.0A when Lift Up is operated from Ground Mode.

After ensuring there is not an Open-Circuit between the M1 Terminal and Pump Motor Positive Terminal, check that the voltage measured between the Pump Motor Negative Terminal and Ground Reference is 24V. If not, examine the issues within Open-Circuit Pump Motor. This voltage should ramp to approximately 0V when Lift Up is operated from Ground Mode. If not, examine the cable between the terminal and the Power Module compartment (M2 Terminal). Inspect crimps for corrosion and ensure that bolted connections are tight. Ensure that the cable is not crushed.

Open-Circuit Pump Motor

This issue will prevent the Pump Motor from operating. Under DIAGNOSTICS -> PUMP, the JLG Analyzer will show PUMP PWM 100% and PUMP CUR 0.0A when Lift Up is operated from Ground Mode.

Pull the Main Battery Disconnect to completely de-energize the Control System. Next, detach the cable from Pump Motor Positive Terminal. Using a voltmeter set for resistance measurement (Ohms), ensure that the resistance between the Pump Motor Positive and Negative Terminals is less than 2 Ohms. If not, examine the pump motor for worn brushes or broken terminals. After examination, re-connect the Pump Motor Positive Terminal and the Main Battery Disconnect.

Short-Circuit between Pump Motor Positive and Negative Terminals

This issue will prevent the Pump Motor from operating. Under DIAGNOSTICS -> PUMP, the JLG Analyzer will show an erratic reading for PUMP PWM% and PUMP CUR will hover around 150A when Lift Up is operated from Ground Mode.

Pull the Main Battery Disconnect to completely de-energize the Control System. Next, detach both Pump Motor Terminals and insulate them independently. Re-connect the Main Battery Disconnect and re-try Lift Up. If the same symptoms persist (erratic PUMP PWM%, PUMP CUR around 150A), examine the cabling between the Pump Motor and Power Module compartment for a short-circuit. If the symptoms change, suspect a short-circuited (or mechanically frozen) pump motor.

A clamp-on ammeter (set for 200A DC) can be placed on either Pump Motor Cable for verification. During Lift Up, the ammeter will read approximately 150A.

Power Module Electrical Evaluation

Several basic electrical tests can be performed on the Power Module. Failure of one of these evaluations is significant and may indicate that the device is physically damaged. If a Power Module is suspected to be faulty, thoroughly examine the rest of the system for possible damage.

Make all measurements with a voltmeter set to resistance scale (Ohms). Disconnect the Main Battery Disconnect and all cables from the Power Module during this analysis. Wait 60 seconds after power is disconnected to allow internal charge to dissipate (risk of hazard, improper readings otherwise).

1. Resistance >100kOhms all Terminals to Housing. Ensure that there is an open-circuit between all terminals of the Power Module and the module's aluminum housing. The device is fully potted and all electronics are insulated from the housing. Place the Black meter lead on the housing and use the Red meter lead to probe all terminals.
2. Resistance < 2 Ohms between B+ and M1. Ensure that there is a short-circuit between the B+ and M1 Terminals. Internally, there is a low-impedance current measurement shunt for the Armature portion of Traction. Place the Red meter lead on B+, and the Black meter lead on M1.
3. Resistance >1MegaOhms between F1 and B-; F2 and B-. Ensure that there is an open-circuit between the two Field Terminals (F1 & F2) and B-. Internally, there are MOSFET transistors between these terminals that should be high-impedance when the module is un-powered. Place the Black meter lead on B- and the Red meter lead on F1 / F2.
4. Resistance >1MegaOhms between F1 and B+; F2 and B+. Ensure that there is an open-circuit between the two Field Terminals (F1 & F2) and B+. Internally, there are MOSFET transistors between these terminals that should be high-impedance when the module is un-powered. Place the Black meter lead on B+ and the Red meter lead on F1 / F2.
5. Resistance >100kOhms between P and B-. Ensure that there is an open-circuit between the P and the B- Terminals. Internally, there are MOSFET transistors between these terminals that should be high-impedance when the module is un-powered. Place the Black meter lead on B-, and the Red meter lead on P. Note that a measurement of increasing resistance (capacitor charge) is normal, but a persistently low impedance is not.
6. Resistance >1kOhms between M2 and B-. Ensure that there is an open-circuit between the M2 and B- Terminals. Internally, there are MOSFET transistors between these terminals that should be high-impedance when the module is un-powered. Place the Black meter lead on B-, and the Red meter lead on M2. Note that a measurement of increasing resistance (capacitor charge) is normal, but a persistently low impedance is not.
7. Resistance 120 Ohms between Pins 10 & 11. Ensure that the resistor that terminates the CAN bus is within tolerance between pins 10 and 11 on the 12 position Mini-Fit Jr. (Connector "B"). Place the Red meter lead on pin 10, and the Black meter lead on pin 11. The resistance should measure between 110 - 130 Ohms.

Pump Motor Electrical Evaluation

Several basic electrical tests can be performed on the Pump Motor. Failure of one of these evaluations is significant and may indicate that the device is physically damaged.

1. Make all measurements with a voltmeter set to resistance scale (Ohms). Disconnect the Main Battery Disconnect and all pump motor cables during this analysis.
2. Resistance < 5 Ohms between Motor Terminals. The internal windings are very low impedance and should appear to be a short-circuit for an ordinary voltmeter (other tests can determine if the windings are truly shorted). High resistance can signal worn brushes, a faulty commutator, or open windings.
3. Resistance > 1 MegaOhm between Motor Terminals and Motor Housing. The internal windings should be electrically isolated from the motor housing. Low resistance may be an indication of a broken motor terminal, damaged brush, faulty commutator, or burned winding.

3.4 DRIVE MODULE - POWER

Step	Pretest Instructions	Test	Result	Corrective Action
3.4.1		Voltage between X074.2 and X099 (B+) = Vbatt?	Yes No	Go to step 3.4.2 Go to step 3.4.4
3.4.2	Pull the ground emergency stop switch and place key switch in ground position	Voltage between X012.1 and X012.2 = Vbatt?	Yes No	Repair or replace Yel/Red 2-16 wire between X012.1 and X074.1 Go to step 3.4.3
3.4.3	Pull the ground emergency stop switch and place key switch in ground position	Voltage on X009.87 = Vbatt?	Yes No	Repair or replace Yel/Red 2-16 wire between X009.87 and X012.1 See 3.9 Ignition Relay - Power
3.4.4		Voltage between X012.2 and X099 (B+) = Vbatt?	Yes No	Repair or replace Black wire between X074.2 and X012.2 Go to step 3.4.5
3.4.5		Voltage between X009.85 and X099 (B+) = Vbatt?	Yes No	Repair or replace Black wire between X012.2 and X009.85 Go to step 3.4.6
3.4.6		Voltage between X004.32 and X099 (B+) = Vbatt?	Yes No	Repair or replace Black wire between X009.85 and X004.32 Consult Factory

3.5 DRIVE SENSOR RESET

If an error is detected with the turntable position sensor or hand brake position sensor, they need to be reset before the control system will accept their values and allow drive and set functions.

Turntable Position Sensor

If an error is detected with the switch or the transport switch does not agree with the turntable position switch, then "TURN-TBL SW ERR" is displayed in the diagnostics. When the boom is set on the boom rest, the transport switch should already be closed (Transport), Turntable1 should change from Off to On, and Turntable2 should change from On to Off. Turntable1

and Turntable2 should always be in opposite states. To reset the switch, lift boom till transport switch opens, then lower onto rest again.

Step	Pretest Instructions	Test	Result	Corrective Action
3.5.1	Place boom on rest, Check Analyzer -> Diagnostics -> Drive	"TURNTBL SW ERR" displayed	Yes No	Go to step 3.5.2 Switch is already reset
3.5.2	Check Analyzer -> Diagnostics -> Drive	"TURNTABLE1 ON" displayed	Yes No	Go to step 3.5.3 Go to step 3.5.5
3.5.3	Check Analyzer -> Diagnostics -> Drive	"TURNTABLE2 OFF" displayed	Yes No	Go to step 3.5.4 Possible Causes: Orn/Red 59-1 wire shorted, 4.1.18
3.5.4	Check Analyzer -> Diagnostics -> System	"TRANS LMT SW CL" displayed	Yes No	Lift boom till transport switch opens, then lower onto rest again to reset the switch Possible Causes: Bad transport switch, see 3.17 Transport Limit Switch
3.5.5		Is boom on rest?	Yes No	Possible Causes: Switch obstructed, 4.1.20, Orn/Red 58-1 wire broken, 4.1.18 Place boom on rest and try again

Hand Brake Position Sensor

If an error is detected with the switch, "HAND BRK SW ERR" is displayed in the diagnostics. As the hand brake is applied, Brake1 should change from Off to On, and Brake2 should change from On to Off. Brake1 and Brake2 should always be in opposite states. To reset the switch, cycle the hand brake.

Step	Pretest Instructions	Test	Result	Corrective Action
3.5.6	Apply hand brake, Check Analyzer -> Diagnostics -> Drive	"HAND BRK SW ERR" displayed	Yes No	Go to step 3.5.7 Switch is already reset
3.5.7	Check Analyzer -> Diagnostics -> Drive	"BRAKE1 ON" displayed	Yes No	Go to step 3.5.8 Go to step 3.5.9
3.5.8	Check Analyzer -> Diagnostics -> Drive	"BRAKE2 OFF" displayed	Yes No	Cycle hand brake to reset the switch Possible Causes: Orn/Red 57-1 wire broken, 4.1.18
3.5.9		Is hand brake applied?	Yes No	Possible Causes: Switch obstructed, Orn/Red 56-1 wire broken, brake cable broken, 4.1.20, 4.1.18 Place boom on rest and try again

3.6 ENGINE POWERED MACHINE - HYDRAULIC PUMP

Step	Pretest Instructions	Test	Result	Corrective Action
3.6.1		Does the engine turn the pump?	Yes No	Possible Causes: 4.1.37, 4.1.43, 4.1.46, 4.1.39 Possible Causes: 4.1.73

3.7 ENGINE POWERED MACHINE - POWER

Step	Pretest Instructions	Test	Result	Corrective Action
3.7.1		Disconnect battery and check for 12V across terminals	less than 12V 12V or greater	Charge or replace batteries Go to step 3.7.2
3.7.2	Disconnect X008	Measure voltage between X099 and X008.1.soc	Vbatt 0V	Go to step 3.7.3 Possible Causes: 4.1.5, 4.1.1
3.7.3	Pull the ground emergency stop switch and place key switch in ground position	Check Voltage on X008.2	0V Vbatt	Go to step 3.7.4 Battery Power OK
3.7.4	Pull the ground emergency stop switch and place key switch in ground position	Check Voltage on X009.87	0V Vbatt	See 3.9 Ignition Relay - Power Repair open in YEL/RED 2-8

3.8 GROUND MODULE - POWER

Step	Pretest Instructions	Test	Result	Corrective Action
3.8.1	Pull the ground emergency stop switch and place key switch in ground position	Voltage between X008.2 and X008.1 = Vbatt?	Yes No	Ground Module Power OK. Possible Causes: 4.1.10 Go to step 3.8.2
3.8.2		Test for continuity between X008.1 and B- (X101 for electric, X100 for engine)	Yes No	See 3.2 DC Powered Machine - Power or 3.7 Engine Powered Machine - Power Repair black ground wire between X008.1 and B-

3.9 IGNITION RELAY - POWER

Step	Pretest Instructions	Test	Result	Corrective Action
3.9.1	Pull the ground emergency stop switch and place key switch in the OFF position	Check Voltage on X009.87	0V Vbatt	Go to step 3.9.2 Possible Causes: 4.1.6, 4.1.7
3.9.2	Pull the ground emergency stop switch and place key switch in ground position	Check Voltage on X009.86	0V Vbatt	Go to step 3.9.4 Go to step 3.9.3
3.9.3	Pull the ground emergency stop switch and place key switch in ground position	Check Voltage on X009.30	0V Vbatt	Go to step 3.9.8 Repair/Replace Ignition Relay
3.9.4	Pull the ground emergency stop switch and place key switch in ground position	Check Voltage at X007.3	0V Vbatt	Go to step 3.9.5 Repair/Replace diode at X009.86
3.9.5	Pull the ground emergency stop switch and place key switch in ground position	Check Voltage at X014.16	0V Vbatt	Go to step 3.9.6 Repair open in YEL/RED 2-5 or YEL/RED 2-10
3.9.6	Pull the ground emergency stop switch and place key switch in ground position	Check Voltage at X026.3	0V Vbatt	Go to step 3.9.7 Repair open in YEL/RED 2-5
3.9.7	Pull the ground emergency stop switch and place key switch in ground position	Check Voltage at X026.2	0V Vbatt	Go to step 3.9.8 Repair/Replace key switch
3.9.8	Pull the ground emergency stop switch and place key switch in ground position	Check Voltage at X037, ground EMS switch	0V Vbatt	Possible Causes: 4.1.65 Otherwise, go to step 3.9.9 Repair open in YEL/RED 2-1 or YEL/RED 2-2
3.9.9		Check Voltage on X013.1	0V Vbatt	Possible Causes: 4.1.64 Otherwise, repair open between X013.1 and B+ Repair open in Red 1-1

SECTION 3 - COMPONENT CHECKS

3.10 JOYSTICK DIAGNOSTICS

Step	Pretest Instructions	Test	Result	Corrective Action
3.10.1	Using the analyzer, navigate to DIAGNOSTICS -> PLAT-FORM -> X-JOYSTK	Is the X-Joystk Voltage between 2.25 and 2.75?	Yes No	Go to step 3.10.2 Go to step 3.10.3
3.10.2	Using the analyzer, navigate to DIAGNOSTICS -> PLAT-FORM -> Y-JOYSTK	Is the Y-Joystk Voltage between 2.25 and 2.75?	Yes No	Possible Causes: 4.1.23, 4.1.22 Go to step 3.10.3
3.10.3	Pull the ground emergency stop switch and place key switch in platform position. Keep the joystick centered	Using a multimeter, is the voltage between X061.4 and X062.2 between 2.25V and 2.75V?	Yes No	Go to step 3.10.4 Go to step 3.10.5
3.10.4	Pull the ground emergency stop switch and place key switch in platform position. Keep the joystick centered	Using a multimeter, is the voltage between X061.3 and X062.2 between 2.25V and 2.75V?	Yes No	Possible Causes: Intermittent Voltage fluctuation, 4.1.22 Go to step 3.10.5
3.10.5		Voltage between X061.1 and X061.2 = 5V (+/- 0.5)?	Yes No	Possible Causes: 4.1.22 Go to step 3.10.6
3.10.6		Voltage between X060.5 and X060.7 = 5V (+/- 0.5)?	Yes No	Repair broken wire Yel/Red 2-18 or black between Platform module and joystick Possible Causes: 4.1.11

3.11 OUTRIGGER SWITCHES - ALL SET

Step	Pretest Instructions	Test	Result	Corrective Action
3.11.1		Analyzer DIAGNOSTICS -> GROUND -> F-L O/R SET	OFF ON	Go to step 3.11.2 Go to step 3.11.3
3.11.2	Disconnect X020	Test for continuity between X020.1 and X020.2	Yes No	Possible Causes: Broken Orn/Red 49-1 or Yel/Red 2-6 Wire, 4.1.10 Possible Causes: 4.1.19, 4.1.20, 4.1.18, broken white or black wire between X020 and X042
3.11.3		Analyzer DIAGNOSTICS GROUND -> F-R O/R SET	OFF ON	Go to step 3.11.4 Go to step 3.11.5
3.11.4	Disconnect X020	Test for continuity between X020.1 and X020.3	Yes No	Possible Causes: Broken Orn/Red 49-2 or Yel/Red 2-6 Wire, 4.1.10 Possible Causes: 4.1.19, 4.1.20, 4.1.18, broken white or black wire between X020 and X043
3.11.5		Analyzer DIAGNOSTICS GROUND -> R-L O/R SET	OFF ON	Go to step 3.11.6 Go to step 3.11.7
3.11.6	Disconnect X020	Test for continuity between X020.1 and X020.4	Yes No	Possible Causes: Broken Orn/Red 49-3 or Yel/Red 2-6 Wire, 4.1.10 Possible Causes: 4.1.19, 4.1.20, 4.1.18, broken white or black wire between X020 and X044

Step	Pretest Instructions	Test	Result	Corrective Action
3.11.7		Analyzer DIAGNOSTICS GROUND -> R-R O/R SET	OFF ON	Go to step 3.11.8 Possible Causes: 4.1.23, 4.1.10
3.11.8	Disconnect X020	Test for continuity between X020.1 and X020.4	Yes No	Possible Causes: Broken Orn/Red 49-4 or Yel/Red 2-6 Wire, 4.1.10 Possible Causes: 4.1.19, 4.1.20, 4.1.18, broken white or black wire between X020 and X045

3.12 OUTRIGGER SWITCHES - ALL STOWED

Step	Pretest Instructions	Test	Result	Corrective Action
3.12.1		Analyzer DIAGNOSTICS GROUND -> F-L O/R SET	OFF ON	Go to step 3.12.3 Go to step 3.12.2
3.12.2	Disconnect X020.2	Voltage on X020.2.soc = Vbatt?	Yes No	Possible Causes: 4.1.19, 4.1.20, 4.1.18, shorted black wire between X020 and X042 Possible Causes: Orn/Red 49-1 shorted, 4.1.10
3.12.3		Analyzer DIAGNOSTICS GROUND -> F-R O/R SET	OFF ON	Go to step 3.12.5 Go to step 3.12.4
3.12.4	Disconnect X020.3	Voltage on X020.3.soc = Vbatt?	Yes No	Possible Causes: 4.1.19, 4.1.20, 4.1.18, shorted black wire between X020 and X043 Possible Causes: Orn/Red 49-2 shorted, 4.1.10
3.12.5		Analyzer DIAGNOSTICS GROUND -> R-L O/R SET	OFF ON	Go to step 3.12.7 Go to step 3.12.6
3.12.6	Disconnect X020.4	Voltage on X020.4.soc = Vbatt?	Yes No	Possible Causes: 4.1.19, 4.1.20, 4.1.18, shorted black wire between X020 and X044 Possible Causes: Orn/Red 49-3 shorted, 4.1.10
3.12.7		Analyzer DIAGNOSTICS GROUND -> R-R O/R SET	OFF ON	Possible Causes: 4.1.23, 4.1.10 Go to step 3.12.8
3.12.8	Disconnect X020.5	Voltage on X020.5.soc = Vbatt?	Yes No	Possible Causes: 4.1.19, 4.1.20, 4.1.18, shorted black wire between X020 and X045 Possible Causes: Orn/Red 49-3 shorted, 4.1.10

3.13 PLATFORM MODULE - POWER

Step	Pretest Instructions	Test	Result	Corrective Action
3.13.1	Pull the ground and platform emergency stop switches and place key switch in the platform position	Voltage between X060.1 and X060.2 = Vbatt?	Yes No	Possible Causes: 4.1.11 Go to step 3.13.2
3.13.2	Pull the ground and platform emergency stop switches and place key switch in the platform position	Voltage between X059.D and X059.H = Vbatt?	Yes No	Repair Platform wiring between X059 and X060 Go to step 3.13.3
3.13.3	Pull the ground and platform emergency stop switches and place key switch in the platform position	Voltage between X008.4 and X008.3 = Vbatt?	Yes No	Go to step 3.13.5 Go to step 3.13.4
3.13.4	Pull the ground and platform emergency stop switches and place key switch in the platform position	Voltage on X008.2 = Vbatt?	Yes No	Possible Causes: 4.1.10 See 3.9 Ignition Relay - Power
3.13.5	Pull the ground and platform emergency stop switches and place key switch in the platform position	Voltage between X019.4 and X019.8 = Vbatt?	Yes No	Go to step 3.13.6 Repair power Yel/Red 2-11 or Black wire between X019 and X008
3.13.6	Pull the ground and platform emergency stop switches and place key switch in the platform position	Voltage between X055.4 and X055.8 = Vbatt?	Yes No	Go to step 3.13.7 Repair power wires between X055 and X019
3.13.7	Pull the ground and platform emergency stop switches and place key switch in the platform position	Voltage between X057.D and X057.H = Vbatt?	Yes No	Repair Blue or Red/Blk power wires between X059 and X057 Repair Blue or Red/Blk power wires between X057 and X055

3.14 POWER MODULE - POWER

Step	Pretest Instructions	Test	Result	Corrective Action
3.14.1	Pull the ground emergency stop switch and place key switch in ground position	Is the power module fault LED flashing?	Yes No	See A.8 Power Module Flash Codes Go to step 3.14.2
3.14.2	Pull the ground emergency stop switch and place key switch in ground position	Is the power module LED illuminated?	Yes No	Possible Causes: 4.1.72, 4.1.12 Go to step 3.14.3
3.14.3		Measured voltage between X102 (B+) and X101 (B-) = Vbatt?	Yes No	Possible Causes: 4.1.12 See 3.2 DC Powered Machine - Power

3.15 TELESCOPE LIMIT SWITCH

Step	Pretest Instructions	Test	Result	Corrective Action
3.15.1		ANALYZER -> DIAGNOSTICS -> SYSTEM -> TELE LMT SW	OP CL	Go to step 3.15.2 Possible Cause: 4.1.23, 4.1.10
3.15.2		Does the Telescope limit switch (X041) spring pull the lever into the slot in the boom?	Yes No	Go to step 3.15.3 Possible Cause: 4.1.19, 4.1.18
3.15.3		Voltage on X004.21 = Vbatt?	Yes No	Possible Cause: 4.1.10 Go to step 3.15.4
3.15.4		Voltage on X018.2 = Vbatt?	Yes No	Wire Orn/Red 49-72 broken. Repair or replace Go to step 3.15.5
3.15.5		Voltage on X041.2 = Vbatt?	Yes No	Black wire broken between X018 and X041. Repair or replace Go to step 3.15.6
3.15.6		Voltage on X041.1 = Vbatt?	Yes No	Possible Cause: 4.1.18 Go to step 3.15.7
3.15.7		Voltage on X018.1 = Vbatt?	Yes No	White wire broken between X018 and X041. Repair or replace Go to step 3.15.8
3.15.8		Voltage on X004.25 = Vbatt?	Yes No	Wire Yel/Red 2-26-1 or Yel/Red 2-26 broken. Repair or replace Possible Cause: 4.1.10

3.16 TILT SENSOR

Step	Pretest Instructions	Test	Result	Corrective Action
3.16.1		Is the ground module securely mounted in a level position?	Yes No	Possible Causes: 4.1.17, 4.1.10 Mount ground module securely to frame, level, and in the upright position as in Figure 7-1

3.17 TRANSPORT LIMIT SWITCH

Step	Pretest Instructions	Test	Result	Corrective Action
3.17.1	Stow the boom	ANALYZER -> DIAGNOSTICS -> SYSTEM -> TRANS LMT SW	OP CL	Go to step 3.17.2 Possible Cause: 4.1.23, 4.1.10
3.17.2		Does the Transport limit switch (X040) spring pull the lever against the cylinder cam?	Yes No	Go to step 3.17.3 Possible Cause: 4.1.19, 4.1.18
3.17.3		Voltage on X004.11 = Vbatt?	Yes No	Possible Cause: 4.1.10 Go to step 3.17.4
3.17.4		Voltage on X015.2 = Vbatt?	Yes No	Wire Orn/Red 49-53 broken. Repair or replace Go to step 3.17.5
3.17.5		Voltage on X040.2 = Vbatt?	Yes No	Black wire broken between X015 and X040. Repair or replace Go to step 3.17.6
3.17.6		Voltage on X040.1 = Vbatt?	Yes No	Possible Cause: 4.1.18 Go to step 3.17.7
3.17.7		Voltage on X015.1 = Vbatt?	Yes No	White wire broken between X015 and X040. Repair or replace Go to step 3.17.8
3.17.8		Voltage on X004.25 = Vbatt?	Yes No	Wire Yel/Red 2-26-1 or Yel/Red 2-26 broken. Repair or replace Possible Cause: 4.1.10

SECTION 4. POSSIBLE CAUSES

4.1 POSSIBLE CAUSES

Item	Possible Cause	Possible Solution
4.1.1	Bad contacts at connector	Repair or replace
4.1.2	System Setup information may be incorrect	Make sure the setup displayed on the analyzer matches the machine
4.1.3	Battery or charger may be installed incorrectly	Check battery wiring and polarity
4.1.4	Improper battery level	Charge or replace batteries
4.1.5	Black battery ground wire may be damaged between X008.1 and B- (engine:X100 or electric:X101)	Repair or replace
4.1.6	Ignition relay at X009 may be defective	Repair or replace
4.1.7	X009.86 may be shorted to battery	Isolate wire shorted to battery and repair. Check Yel/Red 2-5, Yel/Red 2-10, Yel/Red 2-7, Yel/Red 2-44, Yel/Red 2-9
4.1.8	Battery Charger may be defective	Contact Factory
4.1.9	Drive module may be defective	Contact Factory
4.1.10	Ground module may be defective	Contact Factory
4.1.11	Platform module may be defective	Contact Factory
4.1.12	Power module may be defective	Contact Factory
4.1.13	Improper or incompatible software may be installed	Check software versions and replace if necessary
4.1.14	CAN wiring between ground and platform may be defective	Check contacts at X007, X019, X010, X055, X051, X052, or repair CAN wiring
4.1.15	Black ground wire from battery, X100 may be cut	Check continuity to X100 and repair wire or connectors
4.1.16	On board system memory may have been corrupted	Check / correct all settings and re-cycle power to clear difficulty
4.1.17	Integrated Tilt sensor may be defective	Contact Factory
4.1.18	Switch may be defective	Repair or replace
4.1.19	Switch may be stuck	Check for obstructions and switch freedom of motion
4.1.20	Limit Switch may be out of adjustment	Adjust the switch to the specified trip level and retighten
4.1.21	Engine speed pickup may be defective	Repair or replace
4.1.22	Joystick may be defective	See 3.10 Joystick Diagnostics or Repair or replace
4.1.23	Intermittent voltage fluctuation	Check the Help Log for recent recorded problems; Test all conditions
4.1.24	Hourmeter may be defective	Repair or replace
4.1.25	Alarm may be defective	Repair or replace
4.1.26	Joystick calibration may be corrupt	Calibrate
4.1.27	LED or LED module may be defective	Repair or replace
4.1.28	Engine Start / Charge Fuse may be blown	See Engine Owner's Manual for fuse replacement
4.1.29	Engine Charge coil may be defective	Repair or replace, See Engine Owner's Manual for more information
4.1.30	Engine Voltage Rectifier may be defective	Repair or replace, See Engine Owner's Manual for more information
4.1.31	Optional Lift Hook harness may be defective	Check for shorts, opens, and miswired connectors
4.1.32	The boom may be latched to the trailer	Engage lift down, telescope in, and platform leveling until boom is relieved of pressure, unlatch boom and try the function again.
4.1.33	The ground control is being operated without enable	Use enable and try again
4.1.34	The ground may be too uneven for proper outrigger deployment and leveling	Find a more even and/or level area
4.1.35	The ground module may not be mounted properly	Level and properly mount the ground module

SECTION 4 - POSSIBLE CAUSES

4.1 POSSIBLE CAUSES

Item	Possible Cause	Possible Solution
4.1.36	The outrigger switch or solenoid wires may be swapped	Assure that the outriggers are wired correctly.
4.1.37	Hydraulic fluid level may be low	Check for leaks. Fill hydraulic reservoir to recommended level.
4.1.38	Personality may need to be increased to initiate flow	Increase the personality using the analyzer as described in the Operators Manual
4.1.39	Pump may be defective	Repair or replace
4.1.40	Oil filter may be restricted	Replace oil filter
4.1.41	Cylinder may be defective	Repair or replace
4.1.42	Hose may be pinched at turntable	Repair or replace
4.1.43	Hydraulic Manifold may be defective	Repair or replace
4.1.44	Check Valve may be defective	Repair or replace
4.1.45	Main Relief Valve may be defective	Repair or replace
4.1.46	Incorrect hose routing to tank	Repair hose routing
4.1.47	Torn hose	Repair or replace
4.1.48	Holding valve may be defective	Repair or replace
4.1.49	Motion may be mechanically limited	Remove any obstructions
4.1.50	Telescope Out valve may be defective	Repair or replace
4.1.51	Telescope In valve may be defective	Repair or replace
4.1.52	Swing Left valve may be defective	Repair or replace
4.1.53	Swing Right valve may be defective	Repair or replace
4.1.54	Level Up (Extend) valve may be defective	Repair or replace
4.1.55	Level Up (Extend) Relief may be set incorrectly	Check or Set, See Service Manual
4.1.56	Level Down (Retract) valve may be defective	Repair or replace
4.1.57	Level Down (Retract) Relief may be set incorrectly	Check or Set, See Service Manual
4.1.58	Lift up valve may be defective	Repair or replace
4.1.59	Lift Down valve may be defective	Repair or replace
4.1.60	Jib up valve may be defective	Repair or replace
4.1.61	Jib Down valve may be defective	Repair or replace
4.1.62	Outrigger Enable valve on cylinder may be defective	Repair or replace
4.1.63	Outrigger Extend/Retract valve may be defective	Repair or replace
4.1.64	X011 is not connected to the battery	Connect X011 red wire to B + , X011 black wire to B-
4.1.65	30A fuse in ground control box blown	Replace fuse
4.1.66	Key switch not on	Turn to either ground or platform control
4.1.67	Emergency stop switch is pushed	Pull ground emergency stop switch for ground operation or both ground and platform emergency stop switches for platform operation
4.1.68	Enable switch is not held	Hold enable switch while operating
4.1.69	Hydraulic Pump Motor may be defective	Repair or replace
4.1.70	Red Pump Motor Positive wire may be cut	Repair or replace
4.1.71	Black Pump Motor Negative wire may be cut	Repair or replace
4.1.72	Power wire terminals may be corroded or loose	Clean terminals and tighten if loose
4.1.73	Hydraulic pump engine coupling may be defective	Repair or replace

4.1 POSSIBLE CAUSES

Item	Possible Cause	Possible Solution
4.1.74	(Gas Only) Dump Valve may be defective	Repair or replace
4.1.75	(Gas Only) High Idle Inoperable	See 1.8 Engine High Idle Inoperative - Engine Models
4.1.76	(Gas Only) Engine may be mechanically defective	Contact Factory
4.1.77	(Gas Only) Engine start solenoid may be defective	Repair or replace
4.1.78	(Gas Only) Engine throttle pull solenoid may be defective	Repair or replace
4.1.79	(Gas Only) Engine start motor may be defective	Repair or replace
4.1.80	(Gas Only) Engine throttle relay may be defective	Repair or replace
4.1.81	(Gas Only) Engine stop relay may be defective	Repair or replace
4.1.82	(Gas Only) Engine speed feedback incorrect	Repair Wht/Yel 48-7 between X001.16 and X095 or contact factory
4.1.83	(Gas Only) Engine may be out of fuel	Refuel
4.1.84	(Gas Only) Fuel may be old or bad	Drain fuel tank and carburetor. Refuel with fresh gasoline
4.1.85	(Gas Only) Fuel valve may be turned off	Move engine fuel lever to ON
4.1.86	(Gas Only) Engine choke may be open	Engage the choke, unless engine is warm
4.1.87	(Gas Only) Engine oil level may be low	Check/Add oil
4.1.88	(Gas Only) Spark plug may be faulty	Gap or replace spark plug
4.1.89	(Gas Only) Fuel filter may be clogged	Clean or replace
4.1.90	(Gas Only) Air filter may be clogged	Clean or replace
4.1.91	(Gas Only) Fuel system may be clogged	Repair or replace
4.1.92	(Gas Only) Carburetor may be flooded	Dry and reinstall spark plug. Start engine with throttle in fast position
4.1.93	(Gas Only) Engine idle setting may be too low	Increase idle speed to specified value

SECTION 4 - POSSIBLE CAUSES

SECTION 5. SYSTEM TEST MESSAGES

This section Lists all of the possible message responses from the system test mode.

5.1 BATTERY 1/4 LAMP ON

Platform system test is illuminating the platform battery indicator.

ELECTRIC POWERED MACHINES ONLY.

Step	Pretest Instructions	Test	Result	Corrective Action
5.1.1		Does battery indicator illuminate properly?	Yes No	Press ENTER on the analyzer to continue the system test Possible Causes: 4.1.11

5.2 BATTERY 1/2 LAMP ON

See 5.1 BATTERY 1/4 LAMP ON

5.3 BATTERY 3/4 LAMP ON

See 5.1 BATTERY 1/4 LAMP ON

5.4 BATTERY FULL LAMP ON

See 5.1 BATTERY 1/4 LAMP ON

5.5 BATTERY VOLTAGE TOO HIGH

System test prompt that the battery voltage is too high. See 2.3 Battery Voltage Too High - System Shutdown.

5.6 BATTERY VOLTAGE TOO LOW

System test prompt that the battery voltage is too low. See 2.4 Battery Voltage Too Low - System Shutdown.

5.7 CHECK CHOKE SWITCH

System test response indicating that the module input from the choke switch was closed when the system test began testing switch inputs. This may indicate a permanent switch closure.

ENGINE POWERED MACHINES ONLY

See 2.56 Function Problem - Engine Choke Permanently Selected

5.8 CHECK GROUND/PLATFORM SELECT

System test response indicating that the ground module inputs for ground mode and platform mode are both or neither true. A properly wired and functioning machine will show either ground or platform mode true, not both.

See 2.97 Keyswitch Faulty

5.9 CHECK JIB DOWN SWITCH

System test response indicating that the ground module input from the ground panel jib down switch was closed when the system test began testing switch inputs. This may indicate a permanent switch closure.

MODEL T500J ONLY

See 2.60 Function Problem - Jib Down Permanently Selected

5.10 CHECK JIB UP SWITCH

System test response indicating that the ground module input from the ground panel jib up switch was closed when the system test began testing switch inputs. This may indicate a permanent switch closure.

MODEL T500J ONLY

See 2.62 Function Problem - Jib Up Permanently Selected

5.11 CHECK LEVEL DOWN SWITCH

System test response indicating that the ground module input from the ground level down switch was closed when the system test began testing switch inputs. This may indicate a permanent switch closure.

See 2.63 Function Problem - Level Down Permanently Selected

5.12 CHECK LEVEL UP SWITCH

System test response indicating that the ground module input from the ground level up switch was closed when the system test began testing switch inputs. This may indicate a permanent switch closure.

See 2.65 Function Problem - Level Up Permanently Selected

5.13 CHECK LIFT DOWN SWITCH

System test response indicating that the ground module input from the ground lift down switch was closed when the system test began testing switch inputs. This may indicate a permanent switch closure.

See 2.66 Function Problem - Lift Down Permanently Selected

5.14 CHECK LIFT UP SWITCH

System test response indicating that the ground module input from the ground lift up switch was closed when the system test began testing switch inputs. This may indicate a permanent switch closure.

See 2.68 Function Problem - Lift Up Permanently Selected

5.15 CHECK OUTRIGGER SET SWITCH

System test response indicating that the ground module input from the ground outrigger set switch was closed when the system test began testing switch inputs. This may indicate a permanent switch closure.

See 2.70 Function Problem - Outrigger Set Permanently Selected

5.16 CHECK OUTRIGGER STOW SWITCH

System test response indicating that the ground module input from the ground outrigger stow switch was closed when the system test began testing switch inputs. This may indicate a permanent switch closure.

See 2.71 Function Problem - Outrigger Stow Permanently Selected

CHECK POWER & CAN WIRING TO DRIVE MODULE

DRIVE OPTION MACHINES ONLY

System test cannot communicate with the drive module

See 2.7 CANBUS Failure - Drive Module

5.17 CHECK POWER & CAN WIRING TO PLATFORM

System test cannot communicate with the platform module

See 2.8 CANBUS Failure - Platform Module

5.18 CHECK POWER & CAN WIRING TO POWER MODULE

ELECTRIC POWERED MACHINES ONLY

System test cannot communicate with the power module

See 2.8 CANBUS Failure - Platform Module

5.19 CHECK START SWITCH

System test response indicating that the ground module input from the ground start switch was closed when the system test began testing switch inputs. This may indicate a permanent switch closure.

ENGINE POWERED MACHINES ONLY

See 2.58 Function Problem - Engine Start Permanently Selected

5.20 CHECK SWING LEFT SWITCH

System test response indicating that the ground module input from the ground swing left switch was closed when the system test began testing switch inputs. This may indicate a permanent switch closure.

See 2.74 Function Problem - Swing Left Permanently Selected

5.21 CHECK SWING RIGHT SWITCH

System test response indicating that the ground module input from the ground swing right switch was closed when the system test began testing switch inputs. This may indicate a permanent switch closure.

See 2.75 Function Problem - Swing Right Permanently Selected

5.22 CHECK TELESCOPE IN SWITCH

System test response indicating that the ground module input from the ground telescope in switch was closed when the system test began testing switch inputs. This may indicate a permanent switch closure.

See 2.77 Function Problem - Telescope In Permanently Selected

5.23 CHECK TELESCOPE OUT SWITCH

System test response indicating that the ground module input from the ground telescope out switch was closed when the system test began testing switch inputs. This may indicate a permanent switch closure.

See 2.78 Function Problem - Telescope Out Permanently Selected

5.24 CHECKING INPUTS

System test status message indicating that it has begun testing digital inputs to the module being tested (ground or platform).

5.25 CHOKE CL

ENGINE POWERED MACHINES ONLY

System test response indicating that the ground choke switch has been closed when a different switch was expected. Make sure the correct switch is being activated or check the switch wiring.

5.26 CHOKE HOLD

ENGINE POWERED MACHINES ONLY

System test prompt indicating that it is currently testing this circuit.

5.27 CHOKE HOLD SOLENOID OPEN CIRCUIT

ENGINE POWERED MACHINES ONLY

The system test detected an open circuit in the choke hold circuit.

See 2.14 Choke Hold Solenoid Open Circuit

5.28 CHOKE HOLD SOLENOID SHORT TO BATTERY

ENGINE POWERED MACHINES ONLY

The system test detected a short to battery in the choke hold circuit.

See 2.15 Choke Hold Solenoid Short To Battery

5.29 CHOKE HOLD SOLENOID SHORT TO GROUND

ENGINE POWERED MACHINES ONLY

The system test detected a short to ground in the choke hold circuit.

See 2.16 Choke Hold Solenoid Short To Ground

5.30 CHOKE PULL

ENGINE POWERED MACHINES ONLY

System test prompt indicating that it is currently testing this circuit.

5.31 CHOKE PULL RELAY OPEN CIRCUIT

ENGINE POWERED MACHINES ONLY

The system test detected an open circuit in the choke pull circuit.

See 2.17 Choke Pull Relay Open Circuit

5.32 CHOKE PULL RELAY SHORT TO BATTERY

ENGINE POWERED MACHINES ONLY

The system test detected a short to battery in the choke pull circuit.

See 2.18 Choke Pull Relay Short To Battery

5.33 CHOKE PULL RELAY SHORT TO GROUND

ENGINE POWERED MACHINES ONLY

The system test detected a short to ground in the choke pull circuit.

See 2.19 Choke Pull Relay Short To Ground

5.34 CHOKE SWITCH CL

ENGINE POWERED MACHINES ONLY

System test response indicating that the platform choke switch has been closed when a different switch was expected. Make sure the correct switch is being activated or check the switch wiring.

5.35 CL CHOKE

ENGINE POWERED MACHINES ONLY

System test prompt to close the ground panel choke switch. Push the choke button at the ground panel to test the choke switch input and continue the test

5.36 CL CHOKE SWITCH

ENGINE POWERED MACHINES ONLY

System test prompt to close the platform panel choke switch. Push the choke button at the platform panel to test the choke switch input and continue the test.

5.37 CL DRIVE SWITCH

DRIVE OPTION MACHINES ONLY

System test prompt to close the platform panel drive switch. Push the drive button at the platform panel to test the drive switch input and continue the test.

5.38 CL JIB DOWN

T500J ONLY

System test prompt to close the ground panel Jib down switch. Push the Jib switch at the ground panel to the Down position to test the switch input and continue the test.

5.39 CL JIB UP

T500J ONLY

System test prompt to close the ground panel Jib up switch. Push the Jib switch at the ground panel to the Up position to test the switch input and continue the test.

5.40 CL LEVEL DOWN

System test prompt to close the Platform Levelling Down switch. Push the Platform Levelling switch at the ground panel to the Down position to test the switch input and continue the test.

5.41 CL LEVEL UP

System test prompt to close the Platform Levelling Up switch. Push the Platform Levelling switch at the ground panel to the Up position to test the switch input and continue the test.

5.42 CL LIFT DOWN

System test prompt to close the Lift Down switch. Push the Lift switch at the ground panel to the Down position to test the switch input and continue the test.

5.43 CL LIFT UP

System test prompt to close the Lift Up switch. Push the Lift switch at the ground panel to the Up position to test the switch input and continue the test.

5.44 CL O/R SET

System test prompt to close the ground panel Outrigger Set switch. Push the Outrigger switch at the ground panel to the Set position to test the switch input and continue the test.

5.45 CL O/R STOW

System test prompt to close the ground panel Outrigger Stow switch. Push the Outrigger switch at the ground panel to the Stow position to test the switch input and continue the test.

5.46 CL START

ENGINE POWERED MACHINES ONLY

System test prompt to close the ground Start switch. Push the Start button at the ground panel to test the Start switch input and continue the test.

5.47 CL START SWITCH

ENGINE POWERED MACHINES ONLY

System test prompt to close the platform Start switch. Push the Start button at the platform panel to test the Start switch input and continue the test.

5.48 CL SWING LEFT

System test prompt to close the Swing Left switch. Push the Swing switch at the ground panel to the Left position to test the switch input and continue the test.

5.49 CL SWING RIGHT

System test prompt to close the Swing Right switch. Push the Swing switch at the ground panel to the Right position to test the switch input and continue the test.

5.50 CL TELE IN

System test prompt to close the Telescope In switch. Push the Telescope switch at the ground panel to the In position to test the switch input and continue the test.

5.51 CL TELE OUT

System test prompt to close the Telescope Out switch. Push the Telescope switch at the ground panel to the Out position to test the switch input and continue the test.

5.52 CLOSE TRIGGER

System test prompt to close the platform joystick Trigger switch. Push the Trigger switch at the platform panel to test the switch input and continue the test.

5.53 DRIVE SWITCH CL

DRIVE OPTION MACHINES ONLY

System test response indicating that the platform drive switch has been closed when a different switch was expected. Make sure the correct switch is being activated or check the switch wiring.

5.54 DRV ENABLE

DRIVE OPTION MACHINES ONLY

System test prompt indicating that it is currently testing this circuit.

5.55 DRV ENABLE SHORT TO GROUND OR OPEN CIRCUIT

DRIVE OPTION MACHINES ONLY

The system test detected an open circuit or short to ground in the drive enable valve circuit.

See 2.24 Drive Enable Solenoid Short To Ground Or Open Circuit

5.56 DRV ENABLE VALVE SHORT TO BATTERY

DRIVE OPTION MACHINES ONLY

The system test detected a short to battery in the drive enable valve circuit.

See 2.23 Drive Enable Solenoid Short To Battery

5.57 DRV LEFT FWD

DRIVE OPTION MACHINES ONLY

System test prompt indicating that it is currently testing this circuit.

5.58 DRV LEFT FWD VALVE OPEN CIRCUIT

DRIVE OPTION MACHINES ONLY

The system test detected an open circuit in the drive right reverse valve circuit.

See 2.25 Drive Left Forward Solenoid Open Circuit

5.59 DRV LEFT FWD VALVE SHORT TO BATTERY

DRIVE OPTION MACHINES ONLY

The system test detected a short to battery in the drive left forward valve circuit.

See 2.26 Drive Left Forward Solenoid Short To Battery

5.60 DRV LEFT FWD VALVE SHORT TO GROUND

DRIVE OPTION MACHINES ONLY

The system test detected a short to ground in the drive left forward valve circuit.

See 2.27 Drive Left Forward Solenoid Short To Ground

5.61 DRV LEFT REV

DRIVE OPTION MACHINES ONLY

System test prompt indicating that it is currently testing this circuit.

5.62 DRV LEFT REV VALVE OPEN CIRCUIT

DRIVE OPTION MACHINES ONLY

The system test detected an open circuit in the drive right reverse valve circuit.

See 2.28 Drive Left Reverse Solenoid Open Circuit

5.63 DRV LEFT REV VALVE SHORT TO BATTERY

DRIVE OPTION MACHINES ONLY

The system test detected a short to battery in the drive left reverse valve circuit.

See 2.29 Drive Left Reverse Solenoid Short To Battery

5.64 DRV LEFT REV VALVE SHORT TO GROUND

DRIVE OPTION MACHINES ONLY

The system test detected a short to ground in the drive left reverse valve circuit.

See 2.30 Drive Left Reverse Solenoid Short To Ground

5.65 DRV RIGHT FWD

DRIVE OPTION MACHINES ONLY

System test prompt indicating that it is currently testing this circuit.

5.66 DRV RIGHT FWD VALVE OPEN CIRCUIT

DRIVE OPTION MACHINES ONLY

The system test detected an open circuit in the drive right forward valve circuit.

See 2.34 Drive Right Forward Solenoid Open Circuit

5.67 DRV RIGHT FWD VALVE SHORT TO BATTERY

DRIVE OPTION MACHINES ONLY

The system test detected a short to battery in the drive right forward valve circuit.

See 2.35 Drive Right Forward Solenoid Short To Battery

5.68 DRV RIGHT FWD VALVE SHORT TO GROUND

DRIVE OPTION MACHINES ONLY

The system test detected a short to ground in the drive right forward valve circuit.

See 2.36 Drive Right Forward Solenoid Short To Ground

5.69 DRV RIGHT REV

DRIVE OPTION MACHINES ONLY

System test prompt indicating that it is currently testing this circuit.

5.70 DRV RIGHT REV VALVE OPEN CIRCUIT

DRIVE OPTION MACHINES ONLY

The system test detected an open circuit in the drive right reverse valve circuit.

See 2.37 Drive Right Reverse Solenoid Open Circuit

5.71 DRV RIGHT REV VALVE SHORT TO BATTERY

DRIVE OPTION MACHINES ONLY

The system test detected a short to battery in the drive right reverse valve circuit.

See 2.38 Drive Right Reverse Solenoid Short To Battery

5.72 DRV RIGHT REV VALVE SHORT TO GROUND

DRIVE OPTION MACHINES ONLY

The system test detected a short to ground in the drive right reverse valve circuit.

See 2.39 Drive Right Reverse Solenoid Short To Ground

5.73 DUMP VALVE

ENGINE POWERED MACHINES ONLY

System test prompt indicating that it is currently testing this circuit.

5.74 DUMP VALVE OPEN CIRCUIT

ENGINE POWERED MACHINES ONLY

The system test detected an open circuit in the dump valve circuit.

See 2.40 Dump Solenoid Open Circuit

5.75 DUMP VALVE SHORT TO BATTERY

ENGINE POWERED MACHINES ONLY

The system test detected a short to battery in the dump valve circuit.

See 2.41 Dump Solenoid Short To Battery

5.76 DUMP VALVE SHORT TO GROUND

ENGINE POWERED MACHINES ONLY

The system test detected a short to ground in the dump valve circuit.

See 2.42 Dump Solenoid Short To Ground

5.77 ENABLE LAMP ON

System test prompt to check that the platform enable lamp is illuminated. If lamp is illuminating properly, press ENTER on the analyzer to continue the system test. Otherwise, see possible cause 4.1.11

5.78 EXTEND VALVE

System test prompt indicating that it is currently testing this circuit.

5.79 EXTEND VALVE OPEN CIRCUIT

The system test detected an open in the extend valve circuit.

See 2.45 Extend O/R Solenoid Open Circuit

5.80 EXTEND VALVE SHORT TO BATTERY

The system test detected a short to battery in the extend valve circuit.

See 2.46 Extend O/R Solenoid Short To Battery

5.81 EXTEND VALVE SHORT TO GROUND

The system test detected a short to ground in the extend valve circuit.

See 2.47 Extend O/R Solenoid Short To Ground

5.82 F-L O/R VALVE

System test prompt indicating that it is currently testing this circuit.

5.83 F-L OUTRIGGER LAMP ON

System test prompt to check that the ground F-L Outrigger lamp is illuminated.

Step	Pretest Instructions	Test	Result	Corrective Action
5.83.1		Does this indicator illuminate properly?	Yes No	Press ENTER on the analyzer to continue the system test Go to step 5.83.2
5.83.2		Do other indicators illuminate instead?	Yes No	Possible Causes: Check wiring Go to step 5.83.3
5.83.3		Voltage at X030.2 = 12VDC?	Yes No	Possible Causes: 4.1.27 Go to step 5.83.4
5.83.4		Voltage at X004.13 = 12VDC?	Yes No	Possible Causes: Check wires Brn/Wht 47-25, Brn/Wht 47-25-1, and Black Possible Causes: 4.1.10

5.84 F-L OUTRIGGER VALVE OPEN CIRCUIT

The system test detected an open in the F-L Outrigger valve circuit.

See 2.48 Front-Left O/R Solenoid Open Circuit

5.85 F-L OUTRIGGER VALVE SHORT TO BATTERY

The system test detected a short to battery in the F-L Outrigger valve circuit.

See 2.49 Front-Left O/R Solenoid Short To Battery

5.86 F-L OUTRIGGER VALVE SHORT TO GROUND

The system test detected a short to ground in the F-L Outrigger valve circuit.

See 2.50 Front-Left O/R Solenoid Short To Ground

5.87 F-R O/R VALVE

System test prompt indicating that it is currently testing this circuit.

5.88 F-R OUTRIGGER LAMP ON

System test prompt to check that the ground F-R Outrigger lamp is illuminated.

Step	Pretest Instructions	Test	Result	Corrective Action
5.88.1		Does this indicator illuminate properly?	Yes No	Press ENTER on the analyzer to continue the system test Go to step 5.88.2
5.88.2		Do other indicators illuminate instead?	Yes No	Possible Causes: Check wiring Go to step 5.88.3
5.88.3		Voltage at X030.6 = 12VDC?	Yes No	Possible Causes: 4.1.27 Go to step 5.88.4

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Step	Pretest Instructions	Test	Result	Corrective Action
5.88.4		Voltage at X004.26 = 12VDC?	Yes	Possible Causes: Check wires Brn/Wht 47-22, Brn/Wht 47-22-1, and Black
			No	Possible Causes: 4.1.10

5.89 F-R OUTRIGGER VALVE OPEN CIRCUIT

The system test detected an open in the F-R Outrigger valve circuit.

See 2.51 Front-Right O/R Solenoid Open Circuit

5.90 F-R OUTRIGGER VALVE SHORT TO BATTERY

The system test detected a short to battery in the F-R Outrigger valve circuit.

See 2.52 Front-Right O/R Solenoid Short To Battery

5.91 F-R OUTRIGGER VALVE SHORT TO GROUND

The system test detected a short to ground in the F-R Outrigger valve circuit.

See 2.53 Front-Right O/R Solenoid Short To Ground

5.92 GROUND ALARM ON

Ground system test is sounding the ground alarm.

Step	Pretest Instructions	Test	Result	Corrective Action
5.92.1		Does ground alarm sound properly?	Yes	Press ENTER on the analyzer to continue the system test
			No	Possible Causes: Broken Orn/Red 49-11 or black wire, Bad ground alarm, 4.1.10

5.93 HIGH TILT ANGLE

System test prompt that the tilt sensor is reporting an unsafe tilt angle (19 degrees or more). See 2.13 Chassis Tilt Sensor Out Of Range.

5.94 JIB DN VALVE

System test prompt indicating that it is currently testing this circuit.

5.95 JIB DOWN CL

System test response indicating that the ground Jib Down switch has been closed when a different switch was expected. Make sure the correct switch is being activated or check the switch wiring.

5.96 JIB DOWN VALVE OPEN CIRCUIT

The system test detected an open in the Jib Down valve circuit.

See 2.88 Jib Down Solenoid Open Circuit

5.97 JIB DOWN VALVE SHORT TO BATTERY

The system test detected a short to battery in the Jib Down valve circuit.

See 2.89 Jib Down Solenoid Short To Battery

5.98 JIB DOWN VALVE SHORT TO GROUND

The system test detected a short to ground in the Jib Down valve circuit.

See 2.90 Jib Down Solenoid Short To Ground

5.99 JIB UP CL

System test response indicating that the ground Jib Up switch has been closed when a different switch was expected. Make sure the correct switch is being activated or check the switch wiring.

5.100 JIB UP VALVE

System test prompt indicating that it is currently testing this circuit.

5.101 JIB UP VALVE OPEN CIRCUIT

The system test detected an open in the Jib Up valve circuit.

See 2.91 Jib Up Solenoid Open Circuit

5.102 JIB UP VALVE SHORT TO BATTERY

The system test detected a short to battery in the Jib Up valve circuit.

See 2.92 Jib Up Solenoid Short To Battery

5.103 JIB UP VALVE SHORT TO GROUND

The system test detected a short to ground in the Jib Up valve circuit.

See 2.93 Jib Up Solenoid Short To Ground

5.104 JOYSTICK FORWARD TO MAX

System test prompt to move the platform joystick forward to the extent for the system to check the voltage. Move the joystick all the way forward to continue the system test. Otherwise, see possible cause 4.1.22

5.105 JOYSTICK LEFT TO MAX

System test prompt to move the platform joystick left to the extent for the system to check the voltage. Move the joystick all the way left to continue the system test. Otherwise, see possible cause 4.1.22

5.106 JOYSTICK REVERSE TO MAX

System test prompt to move the platform joystick reverse to the extent for the system to check the voltage. Move the joystick all the way rearward to continue the system test. Otherwise, see possible cause 4.1.22

5.107 JOYSTICK RIGHT TO MAX

System test prompt to move the platform joystick right to the extent for the system to check the voltage. Move the joystick all the way right to continue the system test. Otherwise, see possible cause 4.1.22

5.108 LEVEL DN VALVE

System test prompt indicating that it is currently testing this circuit.

5.109 LEVEL DOWN CL

System test response indicating that the ground level down switch has been closed when a different switch was expected. Make sure the correct switch is being activated or check the switch wiring.

5.110 LEVEL DOWN VALVE OPEN CIRCUIT

The system test detected an open in the Level Down valve circuit.

See 2.98 Level Down Solenoid Open Circuit

5.111 LEVEL DOWN VALVE SHORT TO BATTERY

The system test detected a short to battery in the Level Down valve circuit.

See 2.99 Level Down Solenoid Short To Battery

5.112 LEVEL DOWN VALVE SHORT TO GROUND

The system test detected a short to ground in the Level Down valve circuit.

See 2.100 Level Down Solenoid Short To Ground

5.113 LEVEL UP CL

System test response indicating that the ground level up switch has been closed when a different switch was expected. Make sure the correct switch is being activated or check the switch wiring.

5.114 LEVEL UP VALVE

System test prompt indicating that it is currently testing this circuit.

5.115 LEVEL UP VALVE OPEN CIRCUIT

The system test detected an open in the Level Up valve circuit.

See 2.101 Level Up Solenoid Open Circuit

5.116 LEVEL UP VALVE SHORT TO BATTERY

The system test detected a short to battery in the Level Up valve circuit.

See 2.102 Level Up Solenoid Short To Battery

5.117 LEVEL UP VALVE SHORT TO GROUND

The system test detected a short to ground in the Level Up valve circuit.

See 2.103 Level Up Solenoid Short To Ground

5.118 LIFT DN VALVE

System test prompt indicating that it is currently testing this circuit.

5.119 LIFT DOWN CL

System test response indicating that the ground lift down switch has been closed when a different switch was expected. Make sure the correct switch is being activated or check the switch wiring.

5.120 LIFT DOWN VALVE OPEN CIRCUIT

The system test detected an open in the Lift Down valve circuit.

See 2.105 Lift Down Solenoid Open Circuit

5.121 LIFT DOWN VALVE SHORT TO BATTERY

The system test detected a short to battery in the Lift Down valve circuit.

See 2.106 Lift Down Solenoid Short To Battery

5.122 LIFT DOWN VALVE SHORT TO GROUND

The system test detected a short to ground in the Lift Up valve circuit.

See 2.107 Lift Down Solenoid Short To Ground

5.123 LIFT UP CL

System test response indicating that the ground lift up switch has been closed when a different switch was expected. Make sure the correct switch is being activated or check the switch wiring.

5.124 LIFT UP VALVE

System test prompt indicating that it is currently testing this circuit.

5.125 LIFT UP VALVE OPEN CIRCUIT

The system test detected an open in the Lift Up valve circuit.

See 2.114 Lift Up Solenoid Open Circuit

5.126 LIFT UP VALVE SHORT TO BATTERY

The system test detected a short to battery in the Lift Up valve circuit.

See 2.115 Lift Up Solenoid Short To Battery

5.127 LIFT UP VALVE SHORT TO GROUND

The system test detected a short to ground in the Lift Up valve circuit.

See 2.116 Lift Up Solenoid Short To Ground

5.128 MULTIPLE CLOSURE

System test response indicating that multiple switches have been closed when a single switch was expected. The desired switch may or may not be one of the switches closing. Make sure that no other switches are being activated or check the switch wiring.

5.129 O/R SET CL

System test response indicating that the ground Outrigger Set switch has been closed when a different switch was expected. Make sure the correct switch is being activated or check the switch wiring.

5.130 O/R SET LAMP ON

System test prompt to check that the platform outriggers set lamp is illuminated. If lamp is illuminating properly, press ENTER on the analyzer to continue the system test. Otherwise, see possible cause 4.1.11

5.131 O/R STOW CL

System test response indicating that the ground Outrigger Stow switch has been closed when a different switch was expected. Make sure the correct switch is being activated or check the switch wiring.

5.132 OP CHOKE

System test prompt to open the ground panel engine Choke switch. Release the switch at the ground panel to test the switch input and continue the test.

5.133 OP CHOKE SWITCH

System test prompt to open the platform panel engine Choke switch. Release the switch at the platform panel to test the switch input and continue the test.

5.134 OP DRIVE SWITCH

System test prompt to open the platform panel drive switch. Release the switch at the platform panel to test the switch input and continue the test.

5.135 OP JIB DOWN

System test prompt to open the ground panel Jib Down switch. Release the switch at the ground panel to test the switch input and continue the test.

5.136 OP JIB UP

System test prompt to open the ground panel Jib Up switch. Release the switch at the ground panel to test the switch input and continue the test.

5.137 OP LEVEL DOWN

System test prompt to open the ground panel Level Down switch. Release the switch at the ground panel to test the switch input and continue the test.

5.138 OP LEVEL UP

System test prompt to open the ground panel Level Up switch. Release the switch at the ground panel to test the switch input and continue the test.

5.139 OP LIFT DOWN

System test prompt to open the ground panel Lift Down switch. Release the switch at the ground panel to test the switch input and continue the test.

5.140 OP LIFT UP

System test prompt to open the ground panel Lift Up switch. Release the switch at the ground panel to test the switch input and continue the test.

5.141 OP O/R SET

System test prompt to open the ground panel Outrigger Set switch. Release the switch at the ground panel to test the switch input and continue the test.

5.142 OP O/R STOW

System test prompt to open the ground panel Outrigger Stow switch. Release the switch at the ground panel to test the switch input and continue the test.

5.143 OP START

System test prompt to open the ground panel engine Start switch. Release the switch at the ground panel to test the switch input and continue the test.

5.144 OP START SWITCH

System test prompt to open the platform panel engine Start switch. Release the switch at the platform panel to test the switch input and continue the test.

5.145 OP SWING LEFT

System test prompt to open the ground panel Swing Left switch. Release the switch at the ground panel to test the switch input and continue the test.

5.146 OP SWING RIGHT

System test prompt to open the ground panel Swing Right switch. Release the switch at the ground panel to test the switch input and continue the test.

5.147 OP TELE IN

System test prompt to open the ground panel Telescope In switch. Release the switch at the ground panel to test the switch input and continue the test.

5.148 OP TELE OUT

System test prompt to open the ground panel Telescope Out switch. Release the switch at the ground panel to test the switch input and continue the test.

5.149 OPEN TRIGGER

System test prompt to open the platform trigger switch. Release the switch at the platform panel to test the switch input and continue the test.

5.150 OPT GROUND ALARM ON

Ground system test is sounding the optional ground (motion) alarm.

Step	Pretest Instructions	Test	Result	Corrective Action
5.150.1		Does the alarm sound properly?	Yes No	Press ENTER on the analyzer to continue the system test Possible Causes: Broken Yel/Red 2-13 or Yel/Red 2-14 or black wire, Bad ground alarm, 4.1.10

5.151 PLATFORM ALARM ON

System test prompt to check that the platform alarm is sounding. If alarm is sounding properly, press ENTER on the analyzer to continue the system test. Otherwise, see possible cause 4.1.11

5.152 RETRACT VALVE

System test prompt indicating that it is currently testing this circuit.

5.153 RETRACT VALVE OPEN CIRCUIT

The system test detected an open in the Retract Outriggers valve circuit.

See 2.135 Retract O/R Solenoid Open Circuit

5.154 RETRACT VALVE SHORT TO BATTERY

The system test detected a short to battery in the Retract Outriggers valve circuit.

See 2.136 Retract O/R Solenoid Short To Battery

5.155 RETRACT VALVE SHORT TO GROUND

The system test detected a short to ground in the Retract Outriggers valve circuit.

See 2.137 Retract O/R Solenoid Short To Ground

5.156 R-L O/R VALVE

System test prompt indicating that it is currently testing this circuit.

5.157 R-L OUTRIGGER LAMP ON

System test prompt to check that the ground Rear-Left Outrigger lamp is illuminated.

Step	Pretest Instructions	Test	Result	Corrective Action
5.157.1		Does this indicator illuminate properly?	Yes No	Press ENTER on the analyzer to continue the system test Go to step 5.157.2
5.157.2		Do other indicators illuminate instead?	Yes No	Possible Causes: Check wiring Go to step 5.157.3
5.157.3		Voltage at X030.3 = 12VDC?	Yes No	Possible Causes: 4.1.27 Go to step 5.157.4
5.157.4		Voltage at X004.29 = 12VDC?	Yes No	Possible Causes: Check wires Brn/Wht 47-24, Brn/Wht 47-24-1, and Black Possible Causes: 4.1.10

5.158 R-L OUTRIGGER VALVE OPEN CIRCUIT

The system test detected an open in the Rear-Left Outriggers valve circuit.

See 2.129 Rear-Left O/R Solenoid Open Circuit

5.159 R-L OUTRIGGER VALVE SHORT TO BATTERY

The system test detected a short to battery in the Rear-Left Outriggers valve circuit.

See 2.130 Rear-Left O/R Solenoid Short To Battery

5.160 R-L OUTRIGGER VALVE SHORT TO GROUND

The system test detected a short to ground in the Rear-Left Outriggers valve circuit.

See 2.131 Rear-Left O/R Solenoid Short To Ground

5.161 ROTARY TO JIB/TELE

Platform system test prompt to turn the rotary select switch to the Jib/Telescope position.

5.162 ROTARY TO LEVEL

Platform system test prompt to turn the rotary select switch to the Platform Leveling position.

5.163 ROTARY TO LIFT/SWING

Platform system test prompt to turn the rotary select switch to the Lift/Swing position.

5.164 R-R O/R VALVE

System test prompt indicating that it is currently testing this circuit.

5.165 R-R OUTRIGGER LAMP ON

System test prompt to check that the ground Rear-Right Outrigger lamp is illuminated.

Step	Pretest Instructions	Test	Result	Corrective Action
5.165.1		Does this indicator illuminate properly?	Yes No	Press ENTER on the analyzer to continue the system test Go to step 5.165.2
5.165.2		Do other indicators illuminate instead?	Yes No	Possible Causes: Check wiring Go to step 5.165.3
5.165.3		Voltage at X030.7 = 12VDC?	Yes No	Possible Causes: 4.1.27 Go to step 5.165.4
5.165.4		Voltage at X004.14 = 12VDC?	Yes No	Possible Causes: Check wires Brn/Wht 47-23, Brn/Wht 47-23-1, and Black Possible Causes: 4.1.10

5.166 R-R OUTRIGGER VALVE OPEN CIRCUIT

The system test detected an open in the Rear-Right Outrigger valve circuit.

See 2.132 Rear-Right O/R Solenoid Open Circuit

5.167 R-R OUTRIGGER VALVE SHORT TO BATTERY

The system test detected a short to battery in the Rear-Right Outriggers valve circuit.

See 2.133 Rear-Right O/R Solenoid Short To Battery

5.168 R-R OUTRIGGER VALVE SHORT TO GROUND

The system test detected a short to ground in the Rear-Right Outriggers valve circuit.

See 2.134 Rear-Right O/R Solenoid Short To Ground

5.169 RUNNING

System test prompt indicating that it is currently running tests

5.170 START CL

ENGINE POWERED MACHINES ONLY

System test response indicating that the ground start switch has been closed when a different switch was expected. Make sure the correct switch is being activated or check the switch wiring.

5.171 START SOLENOID

ENGINE POWERED MACHINES ONLY

System test prompt indicating that it is currently testing this circuit.

5.172 START SOLENOID OPEN CIRCUIT

ENGINE POWERED MACHINES ONLY

The system test detected an open in the Start circuit.

See 2.141 Start Solenoid Open Circuit

5.173 START SOLENOID SHORT TO BATTERY

ENGINE POWERED MACHINES ONLY

The system test detected a short to battery in the Engine Start circuit.

See 2.142 Start Solenoid Short To Battery

5.174 START SOLENOID SHORT TO GROUND

ENGINE POWERED MACHINES ONLY

The system test detected a short to ground in the Engine Start circuit.

See 2.143 Start Solenoid Short To Ground

5.175 START SWITCH CL

ENGINE POWERED MACHINES ONLY

System test response indicating that the platform start switch has been closed when a different switch was expected. Make sure the correct switch is being activated or check the switch wiring.

5.176 SWING LEFT CL

ENGINE POWERED MACHINES ONLY

System test response indicating that the ground swing left switch has been closed when a different switch was expected. Make sure the correct switch is being activated or check the switch wiring.

5.177 SWING LEFT VALVE OPEN CIRCUIT

The system test detected an open in the Swing Left valve circuit.

See 2.144 Swing Left Solenoid Open Circuit

5.178 SWING LEFT VALVE SHORT TO BATTERY

The system test detected a short to battery in the Swing Left valve circuit.

See 2.145 Swing Left Solenoid Short To Battery

5.179 SWING LEFT VALVE SHORT TO GROUND

The system test detected a short to ground in the Swing Left valve circuit.

See 2.146 Swing Left Solenoid Short To Ground

5.180 SWING LT VALVE

System test prompt indicating that it is currently testing this circuit.

5.181 SWING RIGHT CL

System test response indicating that the ground Swing Right switch has been closed when a different switch was expected. Make sure the correct switch is being activated or check the switch wiring.

5.182 SWING RIGHT VALVE OPEN CIRCUIT

The system test detected an open in the Swing Right valve circuit.

See 2.147 Swing Right Solenoid Open Circuit

5.183 SWING RIGHT VALVE SHORT TO BATTERY

The system test detected a short to battery in the Swing Right valve circuit.

See 2.148 Swing Right Solenoid Short To Battery

5.184 SWING RIGHT VALVE SHORT TO GROUND

The system test detected a short to ground in the Swing Right valve circuit.

See 2.149 Swing Right Solenoid Short To Ground

5.185 SWING RT VALVE

System test prompt indicating that it is currently testing this circuit.

5.186 SYSTEM DISTRESS LAMP ON

System test prompt to check that the system distress lamp is illuminated.

Step	Pretest Instructions	Test	Result	Corrective Action
5.186.1		Does this indicator illuminate properly?	Yes No	Press ENTER on the analyzer to continue the system test Go to step 5.186.2
5.186.2		Do other indicators illuminate instead?	Yes No	Possible Causes: Check wiring Go to step 5.186.3
5.186.3		Which test is running?	Ground System Test Platform System Test	Possible Causes: Brn/Wht 47-20 wire broken, 4.1.27, 4.1.10 Possible Causes: 4.1.11

5.187 TELE IN CL

System test response indicating that the ground Telescope In switch has been closed when a different switch was expected. Make sure the correct switch is being activated or check the switch wiring.

5.188 TELE IN VALVE

System test prompt indicating that it is currently testing this circuit.

5.189 TELE OUT CL

System test response indicating that the ground Telescope Out switch has been closed when a different switch was expected. Make sure the correct switch is being activated or check the switch wiring.

5.190 TELE OUT VALVE

System test prompt indicating that it is currently testing this circuit.

5.191 TELESCOPE IN VALVE OPEN CIRCUIT

The system test detected an open in the Telescope In valve circuit.

See 2.152 Telescope In Solenoid Open Circuit

5.192 TELESCOPE IN VALVE SHORT TO BATTERY

The system test detected a short to battery in the Telescope In valve circuit.

See 2.153 Telescope In Solenoid Short To Battery

5.193 TELESCOPE IN VALVE SHORT TO GROUND

The system test detected a short to ground in the Telescope In valve circuit.

See 2.154 Telescope In Solenoid Short To Ground

5.194 TELESCOPE OUT VALVE OPEN CIRCUIT

The system test detected an open in the Telescope Out valve circuit.

See 2.155 Telescope Out Solenoid Open Circuit

5.195 TELESCOPE OUT VALVE SHORT TO BATTERY

The system test detected a short to battery in the Telescope Out valve circuit.

See 2.156 Telescope Out Solenoid Short To Battery

5.196 TELESCOPE OUT VALVE SHORT TO GROUND

The system test detected a short to ground in the Telescope Out valve circuit.

See 2.157 Telescope Out Solenoid Short To Ground

5.197 TESTS COMPLETE

System test message indicating that the testing is completed.

5.198 THROTTLE HOLD

ENGINE POWERED MACHINES ONLY

System test prompt indicating that it is currently testing this circuit.

5.199 THROTTLE HOLD SOLENOID OPEN CIRCUIT

ENGINE POWERED MACHINES ONLY

The system test detected an open in the Throttle Hold circuit.

See 2.158 Throttle Hold Solenoid Open Circuit

5.200 THROTTLE HOLD SOLENOID SHORT TO BATTERY

ENGINE POWERED MACHINES ONLY

The system test detected a short to battery in the Engine Throttle Hold circuit.

See 2.159 Throttle Hold Solenoid Short To Battery

5.201 THROTTLE HOLD SOLENOID SHORT TO GROUND

ENGINE POWERED MACHINES ONLY

The system test detected a short to ground in the Engine Throttle Hold valve circuit.

See 2.160 Throttle Hold Solenoid Short To Ground

5.202 THROTTLE PULL

ENGINE POWERED MACHINES ONLY

System test prompt indicating that it is currently testing this circuit.

5.203 THROTTLE PULL RELAY OPEN CIRCUIT

ENGINE POWERED MACHINES ONLY

The system test detected an open in the Throttle Pull circuit.

See 2.161 Throttle Pull Relay Open Circuit

5.204 THROTTLE PULL RELAY SHORT TO BATTERY

ENGINE POWERED MACHINES ONLY

The system test detected a short to battery in the Engine Throttle Pull circuit.

See 2.162 Throttle Pull Relay Short To Battery

5.205 THROTTLE PULL RELAY SHORT TO GROUND

ENGINE POWERED MACHINES ONLY

The system test detected a short to ground in the Engine Throttle Pull circuit.

See 2.163 Throttle Pull Relay Short To Ground

5.206 TILT LAMP ON

System test prompt to check that the platform tilt lamp is illuminating properly. If the lamp is illuminating properly, press ENTER on the analyzer to continue the system test. Otherwise, see possible cause 4.1.11

SECTION 6. CALIBRATION MESSAGES

This section is reserved for messages related to the calibration process using the analyzer.

SECTION 7. ELECTRICAL REFERENCE

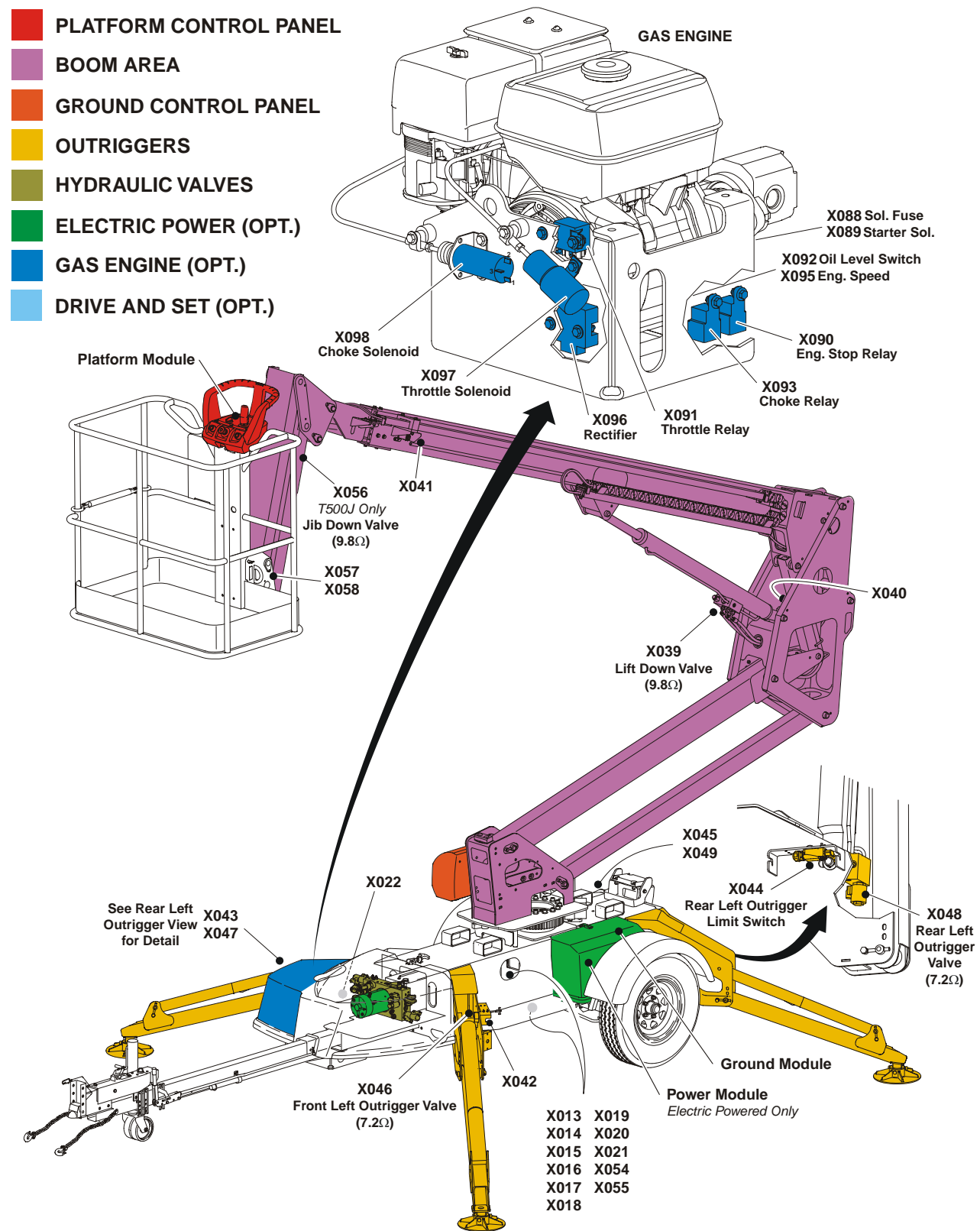


Figure 7-1. Frame Connector Layout

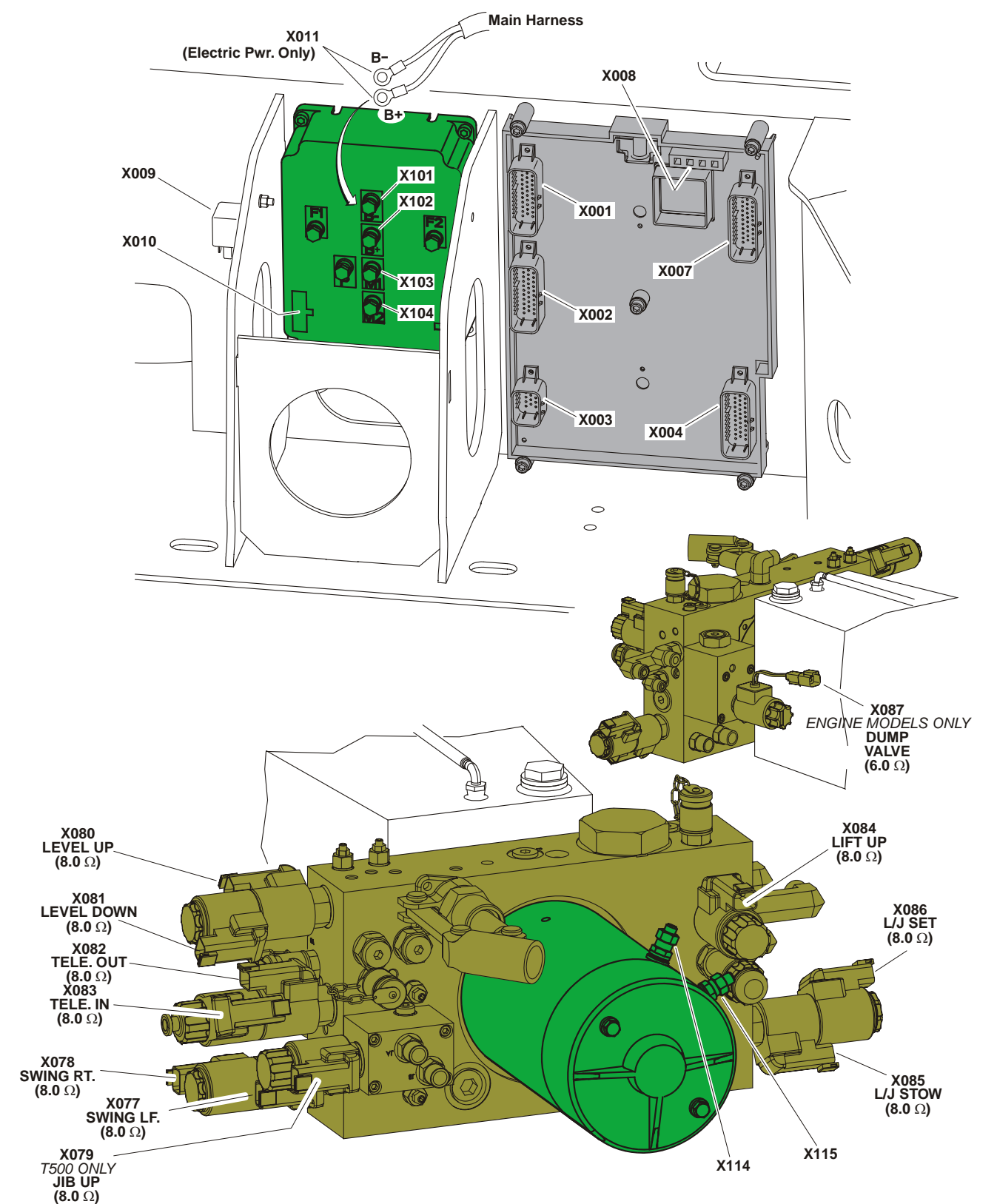


Figure 7-2. Ground Control / Valve Connections

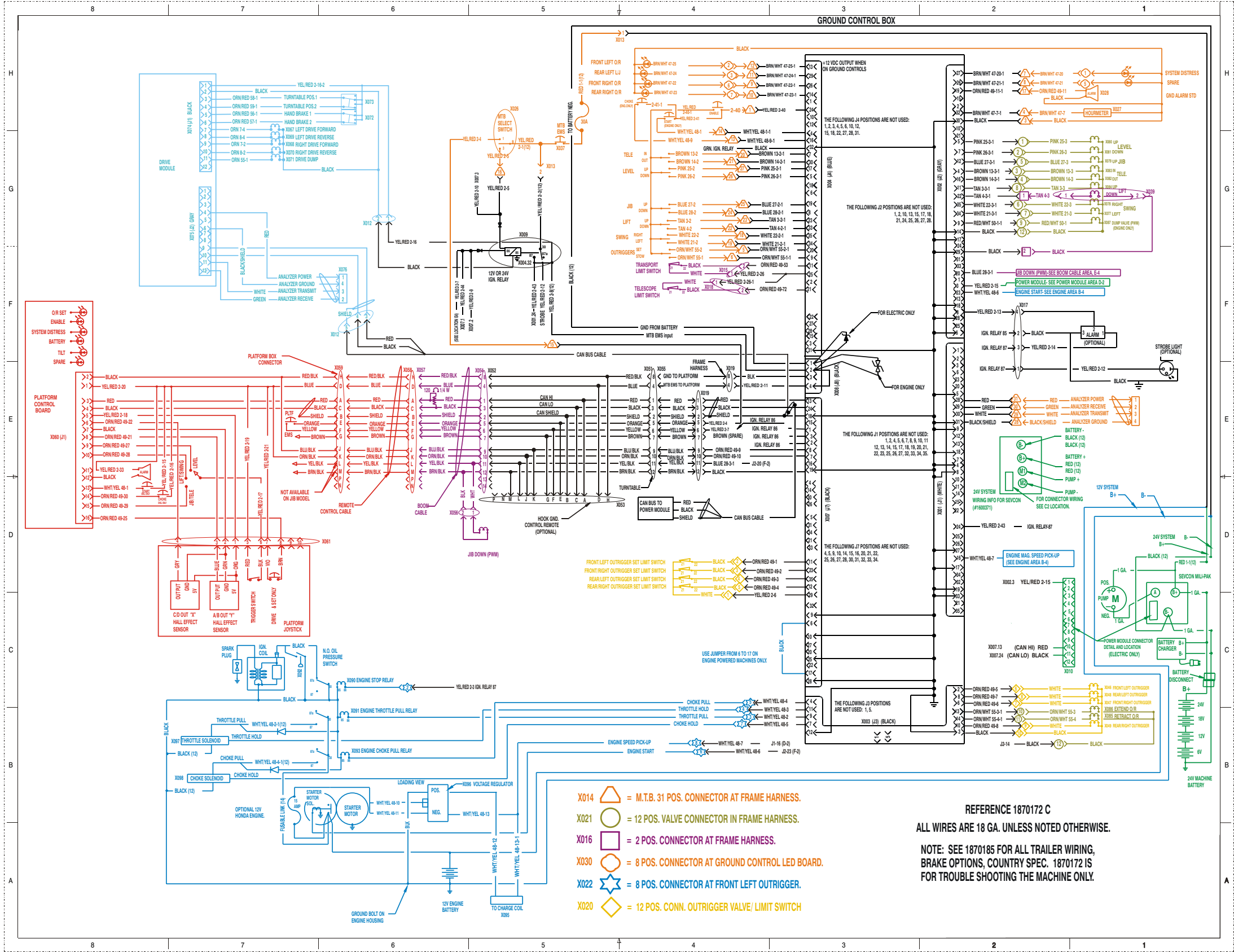


Figure 7-3. Electrical Schematic

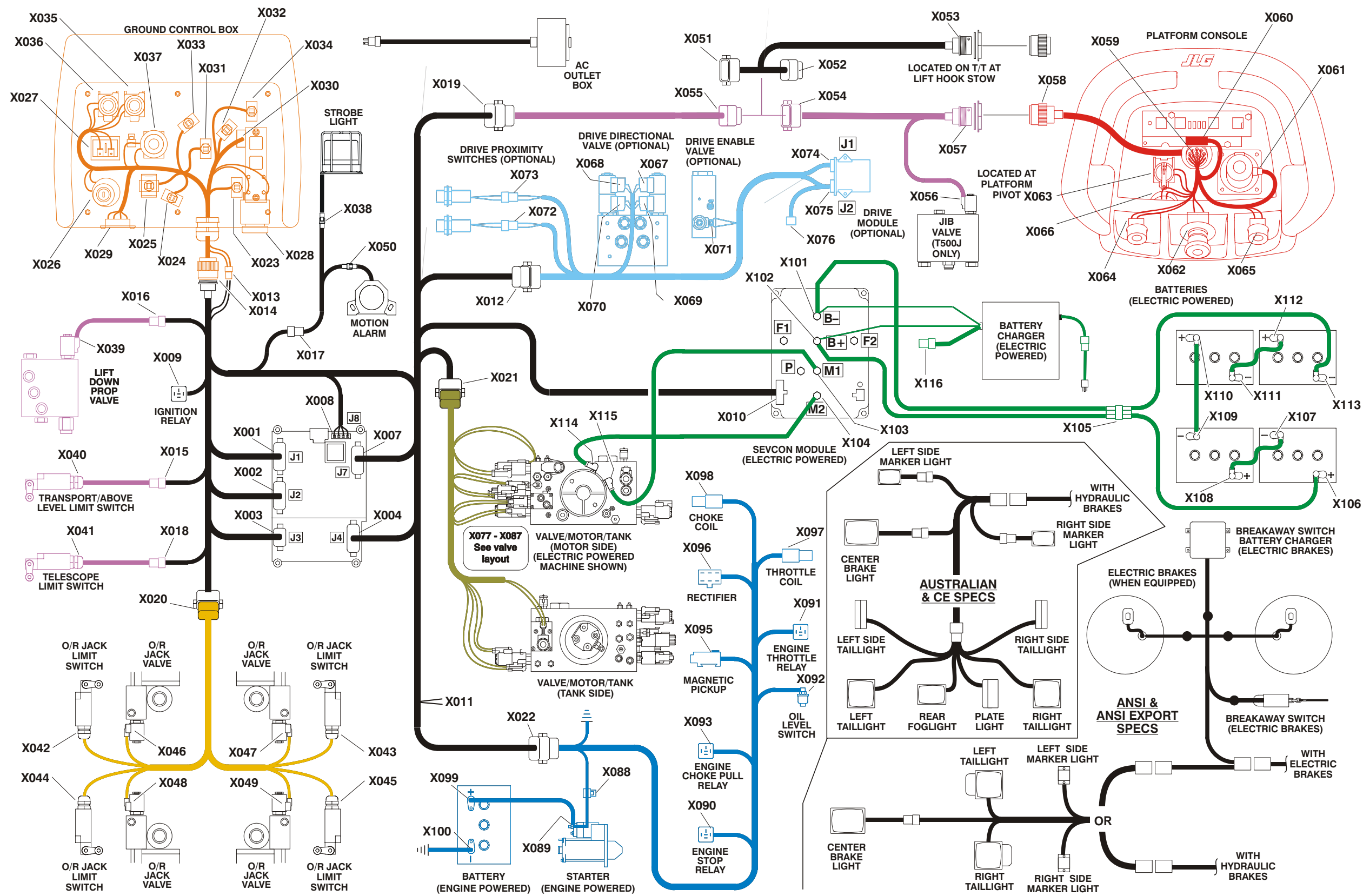


Figure 7-4. Electrical Diagram

Ref. 1870172 Rev C

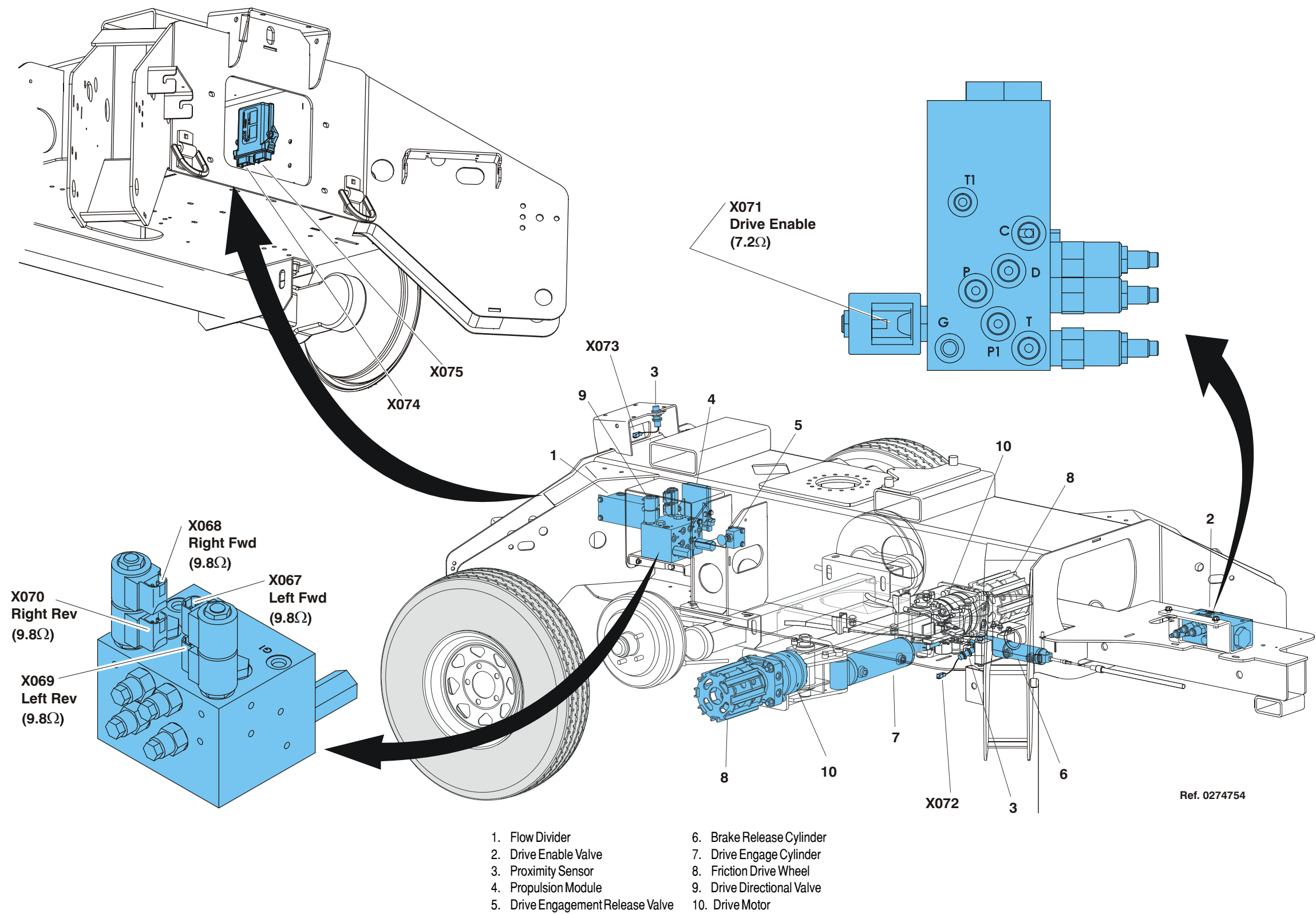


Figure 7-5. Drive and Set

7.1 CONNECTOR INDEX

Table 7-1. Connector Index

ID	Description	End 1 ID	End 2 ID	Location in Schematic, Figure 7-3	Drawings
X001	Ground Module, J1	--	AS352P (Neutral)	2D	Figure: 7-1
X002	Ground Module, J2	--	AS354P (Gray)	2G	Figure: 7-2
X003	Ground Module, J3	--	AS14P	3B	Figure: 7-2
X004	Ground Module, J4	--	AS355P (Blue)	3G	Figure: 7-2
X007	Ground Module, J7	--	AS351P (Black)	3D	Figure: 7-2
X008	Ground Module, J8	--	M04P	3E	Figure: 7-2
X009	IGN Relay	No Drawing	--	5F	Figure: 7-2
X010	Power Module (Sevcon), P	MMF12P	--	2C	Figure: 7-2
X011	Main Harness power	No Drawing	--	1D	Figure: 7-2
X012	Drive Module	DT06R	DT06AP	6F	--
X013	Ground Module Supply	DTP02P	DTP02R	5H	Figure: 7-1
X014	Ground Control Panel	DHTP31P (plug)	DHTP31R (receptacle)	4H	Figure: 7-1
X015	Transport Limit Pass-through	DT02R	DT02P	4F	Figure: 7-1
X016	Lift Down Pass-through	DT02R	DT02P	1G	Figure: 7-1
X017	Strobe/Alarm Pass-through	DT04R	DT04P	2F	Figure: 7-1
X018	Tele Limit Pass-through	DT02P	DT02R	4F	Figure: 7-1
X019	Boom Cable	DT12AP	DT12AR	4E	Figure: 7-1
X020	Outrigger Switches Pass-through	DT12AR	DT12AP	2C	Figure: 7-1
X021	Valves Pass-through	DT12AR	DT12AP	2B	Figure: 7-1
X022	Engine Pass-through	DT08AR	DT08AP	4B	Figure: 7-1
X023	Ground Outriggers Sw	E06P	--	4F	Figure: 7-4
X024	Ground Swing Sw	E06P	--	4G	Figure: 7-4
X025	Ground Enable Sw	No Drawing	--	4H	Figure: 7-4
X026	Ground Key Sw	No Drawing	--	5G	Figure: 7-4
X027	Ground Hour Meter	No Drawing	--	1H	Figure: 7-4
X028	Ground Alarm	No Drawing	--	1H	Figure: 7-4
X029	Ground Analyzer Port	AMP04P	--	1E	Figure: 7-4
X030	Ground LED Board	MMF08P	--	4H	Figure: 7-4
X031	Ground Lift Sw	E06P	--	4G	Figure: 7-4
X032	Ground Jib Sw	E06P	--	4G	Figure: 7-4
X033	Ground Tele Sw	E06P	--	4G	Figure: 7-4
X034	Ground Level Sw	E06P	--	4G	Figure: 7-4
X035	Ground Choke Sw	No Drawing	--	4H	Figure: 7-4
X036	Ground Start Sw	No Drawing	--	4H	Figure: 7-4
X037	Ground EMG Stop	No Drawing	--	5G	Figure: 7-4
X038	Strobe Light	DT02R	DT02P	1E	--
X039	Lift Down Valve Solenoid	DT02P	--	1G	Figure: 7-1
X040	Transport Limit Sw	No Drawing	--	4F	Figure: 7-1
X041	Tele Limit Sw	No Drawing	--	4F	Figure: 7-1
X042	F/L Outrigger Limit Sw	No Drawing	--	4D	Figure: 7-1
X043	F/R Outrigger Limit Sw	No Drawing	--	4D	Figure: 7-1
X044	R/L Outrigger Limit Sw	No Drawing	--	4D	Figure: 7-1
X045	R/R Outrigger Limit Sw	No Drawing	--	4D	Figure: 7-1
X046	F/L Outrigger Valve Solenoid	DT02P	--	1C	Figure: 7-1

SECTION 7 - ELECTRICAL REFERENCE

Table 7-1. Connector Index

ID	Description	End 1 ID	End 2 ID	Location in Schematic, Figure 7-3	Drawings
X047	F/R Outtrigger Valve Solenoid	DT02P	--	1C	Figure: 7-1
X048	R/L Outtrigger Valve Solenoid	DT02P	--	1C	Figure: 7-1
X049	R/R Outtrigger Valve Solenoid	DT02P	--	1B	Figure: 7-1
X050	Motion Alarm	DT03P	--	1F	--
X051	Lift Hook Harness to X019	DT12AR	--	4E	Figure: 7-4
X052	Lift Hook Harness to X054	DT12AP	--	5E	Figure: 7-4
X053	Lift Hook Harness to Console X058	DHD14R	--	5D	Figure: 7-4
X054	Platform Harness to X019	--	DT12AP	5E	Figure: 7-1
X055	Platform Boom Connector	DT12AR	--	4E	Figure: 7-1
X056	Jib Down Valve Solenoid	DT02P	--	6D	Figure: 7-1
X057	Platform Harness to console X058	DHD14R	--	6E	Figure: 7-1
X058	Platform Console Main	--	DHD14P	6E	Figure: 7-1
X059	Console Pass-through	DHD14P	--	6E	Figure: 7-4
X060	Platform Module	MMF16P	--	8E	Figure: 7-4
X061	Joystick	MMF10P	--	7D	Figure: 7-4
X062	EMG Stop	No Drawing	--	7E	Figure: 7-4
X063	Rotary Select Sw	No Drawing	--	7D	Figure: 7-4
X064	Choke Sw	No Drawing	--	8D	Figure: 7-4
X065	Start Sw	No Drawing	--	8D	Figure: 7-4
X066	Alarm	No Drawing	--	8E	Figure: 7-4
X067	Drive Left Forward Solenoid	DT02P	--	7H	Figure: 7-5
X068	Drive Right Forward Solenoid	DT02P	--	7G	Figure: 7-5
X069	Drive Left Reverse Solenoid	DT02P	--	7G	Figure: 7-5
X070	Drive Right Reverse Solenoid	DT02P	--	7G	Figure: 7-5
X071	Drive Enable Solenoid	DT02P	--	7G	Figure: 7-5
X072	Handbrake Position Switch	DTM04P	DTM04R	7H	Figure: 7-5
X073	Turntable Position Switch	DTM04P	DTM04R	7H	Figure: 7-5
X074	Drive Module, J1	DTM12BP	--	7H	Figure: 7-5
X075	Drive Module, J2	DTM12AP	--	7G	Figure: 7-5
X076	Drive Module Analyzer Port	AMP04P	--	7F	Figure: 7-4
X077	Swing Left Solenoid	DT02P	--	1G	Figure: 7-2
X078	Swing Right Solenoid	DT02P	--	1G	Figure: 7-2
X079	Jib Up Solenoid	DT02P	--	1G	Figure: 7-2
X080	Level Up Solenoid	DT02P	--	1G	Figure: 7-2
X081	Level Down Solenoid	DT02P	--	1G	Figure: 7-2
X082	Tele Out Solenoid	DT02P	--	1G	Figure: 7-2
X083	Tele In Solenoid	DT02P	--	1G	Figure: 7-2
X084	Lift Up Solenoid	DT02P	--	1G	Figure: 7-2
X085	O/R Stow Solenoid	DT02P	--	1B	Figure: 7-2
X086	O/R Set Solenoid	DT02P	--	1B	Figure: 7-2
X087	Dump Valve Solenoid	DT02P	--	1G	Figure: 7-2
X088	Starter Sol. Fuse	No Drawing	--	7B	Figure: 7-1
X089	Starter Sol.	No Drawing	--	6B	Figure: 7-1
X090	Engine Stop Relay	No Drawing	--	6C	Figure: 7-1
X091	Throttle Pull Relay	No Drawing	--	6B	Figure: 7-1
X092	Engine Oil Level Switch	No Drawing	--	7C	Figure: 7-1

Table 7-1. Connector Index

ID	Description	End 1 ID	End 2 ID	Location in Schematic, Figure 7-3	Drawings
X093	Engine Choke Pull Relay	No Drawing	--	6B	Figure: 7-1
X095	Engine Mag Pickup	SUM02N	--	5A	Figure: 7-1
X096	Engine Rectifier	SUM06N	--	6B	Figure: 7-1
X097	Engine Throttle Solenoid	PWP03P	--	7B	Figure: 7-1
X098	Engine Choke Solenoid	No Drawing	--	7B	Figure: 7-1
X099	Engine Powered, Battery Pos.	No Drawing	--	6A	--
X100	Engine Powered, Battery Neg.	No Drawing	--	6A	--
X101	Power Module (Sevcon), B-	No Drawing	--	1C	Figure: 7-2
X102	Power Module (Sevcon), B+	No Drawing	--	1C	Figure: 7-2
X103	Power Module (Sevcon), M1 +	No Drawing	--	1C	Figure: 7-2
X104	Power Module (Sevcon), M2-	No Drawing	--	1C	Figure: 7-2
X105	Power Module Cable In-line	AN350P	--	1C	--
X106	6V Batt 1, Pos.	No Drawing	--	1C	--
X107	6V Batt 1, Neg.	No Drawing	--	1B	--
X108	6V Batt 2, Pos.	No Drawing	--	1B	--
X109	6V Batt 2, Neg.	No Drawing	--	1B	--
X110	6V Batt 3, Pos.	No Drawing	--	1B	--
X111	6V Batt 3, Neg.	No Drawing	--	1B	--
X112	6V Batt 4, Pos.	No Drawing	--	1B	--
X113	6V Batt 4, Neg.	No Drawing	--	1B	--
X114	Electric Pump Neg.	No Drawing	--	1C	Figure: 7-2
X115	Electric Pump Pos.	No Drawing	--	1C	Figure: 7-2
X116	Battery Charger AC Cord	No Drawing	--	1C	--

7.2 GROUND MODULE CONNECTOR PINOUTS

Table 7-2. X001 (J1) Ground Module Pinout

PIN	T-SERIES FUNCTION	TYPE	I/O	RANGE (V)
1	Depopulated	-	-	-
2	Depopulated	-	-	-
3	Depopulated	-	-	-
4	GROUND	Power	Output	0VDC
5	GROUND	Power	Output	0VDC
6	Depopulated	-	-	-
7	Depopulated	-	-	-
8	GROUND	Power	Output	0VDC
9	GROUND	Power	Input	0VDC
10	Depopulated	-	-	-
11	Depopulated	-	-	-
12	Depopulated	-	-	-
13	Depopulated	-	-	-
14	NOT USED	Analog	Input	-
15	NOT USED	Analog	Input	-
16	ENGINE MAGNETO (SPEED PICKUP)	Digital	Input	AC Coupled Freq.
17	GROUND	Power	Output	0VDC
18	GROUND	Power	Output	0VDC
19	GROUND	Power	Output	0VDC
20	Depopulated	-	-	-
21	NOT USED	Digital	Input	-
22	Depopulated	Digital	Output	-
23	Depopulated	-	-	-
24	CONSTANT BATTERY	Power	Input	12VDC
25	Depopulated	-	-	-
26	Depopulated	-	-	-
27	GROUND	Power	Output	0VDC
28	ANALYZER POWER	Power	Output	9.5VDC
29	RS-232 RECEIVE	Serial	Input	Digital Comm.
30	RS-232 TRANSMIT	Serial	Output	Digital Comm.
31	ANALYZER RETURN	Power	Output	0VDC
32	Depopulated	Power	Output	
33	GROUND	Power	Output	0VDC
34	NOT USED	Digital	Input	-
35	ELECTRIC POWER MODE (FUTURE)	Digital	Input	-

Table 7-3. X002 (J2) Ground Module Pinout

PIN	T-SERIES FUNCTION	TYPE	I/O	RANGE (V)
1	Depopulated	-	-	-
2	Depopulated	-	-	-
3	NOT USED	Digital	Output	
4	TELESCOPE IN	Digital	Output	12VDC
5	LEVEL UP	Digital	Output	12VDC
6	GROUND	Power	Output	0VDC
7	LEVEL DOWN	Digital	Output	12VDC
8	OPTIONAL GROUND ALARM	Digital	Output	PWM
9	DUMP VALVE	Digital	Output	PWM
10	ROTATE LEFT (FUTURE)	Digital	Output	-
11	LIFT UP	Digital	Output	12VDC
12	JIB UP	Digital	Output	12VDC
13	Depopulated	-	-	-
14	GROUND	Power	Output	0VDC
15	NOT USED	Digital	Output	-
16	TELESCOPE OUT	Digital	Output	12VDC
17	GROUND	Power	Output	0VDC
18	GROUND	Power	Output	0VDC
19	GROUND ALARM	Digital	Output	PWM
20	JIB DOWN	Digital	Output	PWM
21	ROTATE RIGHT (FUTURE)	Digital	Output	-
22	LIFT DOWN	Digital	Output	PWM
23	ENGINE START	Digital	Output	12VDC
24	ENGINE POWER MODE (FUTURE)	Digital	Input	-
25	NOT USED	Analog	Input	-
26	OVERLOAD INDICATOR	Digital	Output	-
27	SYSTEM DISTRESS INDICATOR	Digital	Output	Vbatt
28	GROUND	Power	Output	0VDC
29	GROUND	Power	Output	0VDC
30	GROUND	Power	Output	0VDC
31	Depopulated	-	-	-
32	HOUR METER	Digital	Output	12VDC
33	NOT USED	Digital	Output	-
34	SWING LEFT	Digital	Output	12VDC
35	SWING RIGHT	Digital	Output	12VDC

SECTION 7 - ELECTRICAL REFERENCE

Table 7-4. X003 (J3) Ground Module Pinout

PIN	T-SERIES FUNCTION	TYPE	I/O	RANGE (V)
1	Depopulated	-	-	-
2	FRONT-LEFT O/R	Digital	Output	12VDC
3	GROUND	Power	Output	0VDC
4	CHOKE PULL RELAY	Digital	Output	12VDC
5	Depopulated	-	-	-
6	FRONT-RIGHT O/R	Digital	Output	12VDC
7	CHOKE HOLD SOLENOID	Digital	Output	12VDC
8	REAR-LEFT O/R	Digital	Output	12VDC
9	THROTTLE PULL RELAY	Digital	Output	12VDC
10	REAR-RIGHT O/R	Digital	Output	12VDC
11	THROTTLE HOLD SOLENOID	Digital	Output	12VDC
12	GROUND	Power	Output	0VDC
13	EXTEND O/R	Digital	Output	12VDC
14	RETRACT O/R	Digital	Output	12VDC

Table 7-5. X004 (J4) Ground Module Pinout

PIN	T-SERIES FUNCTION	TYPE	I/O	RANGE (V)
1	Depopulated	Digital	Output	-
2	Depopulated	Digital	Output	-
3	Depopulated	Digital	Output	-
4	ENGINE START	Digital	Input	Vbatt
5	LEVEL DOWN	Digital	Input	Vbatt
6	NOT USED	Digital	Input	-
7	TELESCOPE IN	Digital	Input	Vbatt
8	JIB DOWN	Digital	Input	Vbatt
9	O/R STOW	Digital	Input	Vbatt
10	NOT USED	Digital	Input	-
11	TRANSPORT LIMIT	Digital	Input	Vbatt
12	Depopulated	Digital	Output	-
13	REAR-LEFT O/R INDICATOR	Digital	Output	Vbatt
14	REAR-RIGHT O/R INDICATOR	Digital	Output	Vbatt
15	Depopulated	Digital	Output	-
16	ENGINE CHOKE/ GLOW PLUG	Digital	Input	Vbatt
17	LEVEL UP	Digital	Input	Vbatt
18	NOT USED	Digital	Input	-
19	JIB UP	Digital	Input	Vbatt
20	O/R SET	Digital	Input	Vbatt
21	TELESCOPE IN LIMIT SWITCH	Digital	Input	Vbatt
22	NOT USED	Digital	Input	-
23	LIFT UP	Digital	Input	Vbatt
24	IGNITION	Power	Output	0VDC
25	IGNITION	Power	Output	0VDC
26	FRONT-RIGHT O/R INDICATOR	Digital	Output	Vbatt
27	Depopulated	Digital	Output	-
28	Depopulated	Digital	Output	-
29	FRONT-LEFT O/R INDICATOR	Digital	Output	Vbatt
30	TELESCOPE OUT	Digital	Input	Vbatt
31	GROUND	Power	Output	0VDC
32	GROUND	Power	Output	0VDC
33	LIFT DOWN	Digital	Input	Vbatt
34	SWING LEFT	Digital	Input	Vbatt
35	SWING RIGHT	Digital	Input	Vbatt

SECTION 7 - ELECTRICAL REFERENCE

Table 7-6. X007 (J7) Ground Module Pinout

PIN	T-SERIES FUNCTION	TYPE	I/O	RANGE (V)
1	PLATFORM EMS	Power	Input	12VDC
2	PLATFORM MODE	Power	Input	12VDC
3	GROUND MODE	Power	Input	12VDC
4	NOT USED	Analog	Input	-
5	NOT USED	Power	Output	-
6	CAN TERMINATION	Serial	I/O	Serial
7	PLATFORM POSITION 1	Analog	Input	Vbatt
8	PLATFORM POSITION 2	Analog	Input	Vbatt
9	GROUND	Power	Output	0VDC
10	GROUND	Power	Output	0VDC
11	FRONT-LEFT O/R SET LIMIT SW	Digital	Input	Vbatt
12	REAR-RIGHT O/R SET LIMIT SW	Digital	Input	Vbatt
13	CAN-HI	Serial	I/O	Serial
14	NOT USED	Power	Output	-
15	NOT USED	Digital	Input	-
16	NOT USED	Power	Output	-
17	CAN TERMINATION	Serial	I/O	Serial
18	CAN SHIELD	Power	Output	Serial
19	GROUND	Power	Output	0VDC
20	NOT USED	Analog	Input	-
21	NOT USED	Digital	Input	-
22	NOT USED	Digital	Input	-
23	FRONT-RIGHT O/R SET LIMIT SW	Digital	Input	Vbatt
24	CAN-LO	Serial	I/O	Serial
25	GROUND	Power	Output	0VDC
26	NOT USED	Power	Output	-
27	NOT USED	Power	Output	-
28	GROUND	Power	Output	0VDC
29	IGNITION	Power	Output	Vbatt
30	NOT USED	Power	Output	-
31	NOT USED	Power	Output	-
32	NOT USED	Power	Output	-
33	NOT USED	Power	Output	-
34	NOT USED	Power	Output	-
35	REAR-LEFT O/R SET LIMIT SW	Digital	Input	Vbatt

Table 7-7. X008 (J8) Ground Module Pinout

PIN	T-SERIES FUNCTION	TYPE	I/O	RANGE (V)
1	GROUND FROM B-	Power	Input	0VDC
2	IGN PWR FROM IGN RELAY 87	Power	Input	Vbatt
3	GROUND FOR PLATFORM MODULE	Power	Output	0VDC
4	IGN PWR FOR PLATFORM MODULE	Power	Output	Vbatt

7.3 PLATFORM MODULE CONNECTOR PINOUT

Table 7-8. X060 (J1) Platform Module Pinout

PIN	T-SERIES FUNCTION	TYPE	I/O	RANGE (V)
1	IGNITION	Power	Input	Vbatt
2	SYSTEM GROUND	Power	Input	0VDC
3	CANH	Serial	I/O	Serial
4	CANL	Serial	I/O	Serial
5	JOYSTICK SUPPLY	Power	Output	5VDC
6	JOYSTICK X-AXIS	Analog	Input	5VDC
7	JOYSTICK GROUND	Power	Output	0VDC
8	JOYSTICK Y-AXIS	Analog	Input	5VDC
9	ROTARY POSITION 1	Digital	Input	Vbatt
10	ROTARY POSITION 2	Digital	Input	Vbatt
11	SWITCH GROUND	Power	Output	0VDC
12	PLATFORM ALARM	Analog	Output	0VDC
13	START SWITCH	Digital	Input	Vbatt
14	CHOKE / GLOW SWITCH	Digital	Input	Vbatt
15	ROTARY POSITION 3	Digital	Input	Vbatt
16	DRIVE & SET SWITCH	Digital	Input	Vbatt

7.4 DRIVE MODULE CONNECTOR PINOUT

Table 7-9. X074 (J1) Drive Module Pinout

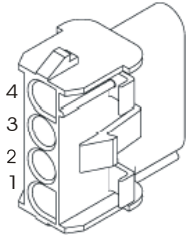
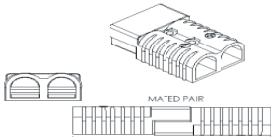
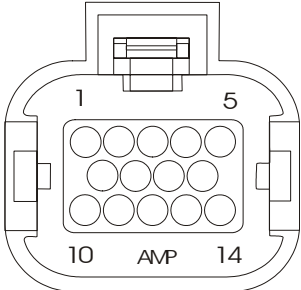
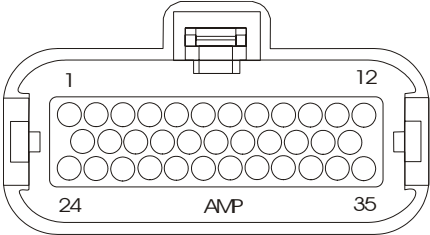
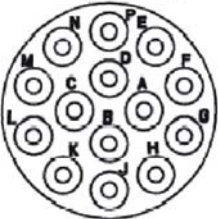
PIN	T-SERIES FUNCTION	TYPE	I/O	RANGE (V)
1	IGNITION	Power	Input	Vbatt
2	SYSTEM GROUND	Power	Input	0VDC
3	TURNTABLE POSITION 1	Digital	Input	Vbatt
4	TURNTABLE POSITION 2	Analog	Input	Vbatt
5	SPARE INPUT 2	Analog	Input	-
6	SPARE INPUT 3	Analog	Input	-
7	DRIVE LEFT FORWARD	Analog	Output	PWM
8	DRIVE LEFT REVERSE	Analog	Output	PWM
9	DRIVE RIGHT FORWARD	Analog	Output	PWM
10	DRIVE RIGHT REVERSE	Analog	Output	PWM
11	DRIVE ENABLE	Analog	Output	PWM
12	SPARE OUTPUT 5	Analog	Output	-

Table 7-10. X075 (J2) Drive Module Pinout

PIN	T-SERIES FUNCTION	TYPE	I/O	RANGE (V)
1	+5 ANALOG REFERENCE	Power	Output	5VDC
2	SPARE ANALOG 0	Analog	Output	-
3	ANALOG GROUND	Analog	Output	0VDC
4	ANALYZER +5 REF	Power	Output	5VDC
5	SPARE ANALOG 1	Analog	Output	-
6	ANALYZER GROUND	Power	Output	0VDC
7	SPARE ANALOG 2	Analog	Output	-
8	SPARE ANALOG 3	Analog	Output	-
9	CANBUS CANH	Serial	I/O	Serial
10	CANBUS CANL	Serial	I/O	Serial
11	ANALYZER PIN #3	Serial	I/O	Serial
12	ANALYZER PIN #2	Serial	I/O	Serial

7.5 CONNECTOR LOADING DIAGRAMS

Table 7-11. Connector Loading Diagrams

ID	Description	Diagram
AMP04P	Amp 4 position plug	
AN350P	Anderson Power Connector	
AS14P	Ampseal 14 position	 Socket Rear Insert
AS351P (Black) AS352P (Neutral) AS354P (Gray) AS355P (Blue)	Ampseal 35 position	 Socket Rear Insert
DHD14P	Deutsch 14 position HD series alum. Plug	 Rear View

SECTION 7 - ELECTRICAL REFERENCE

Table 7-11. Connector Loading Diagrams


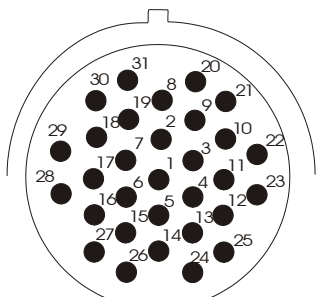
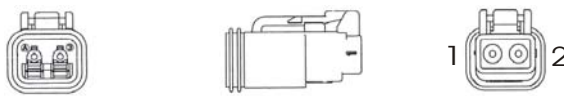
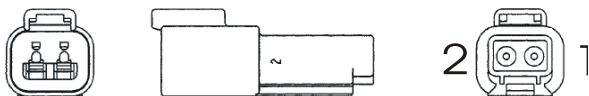
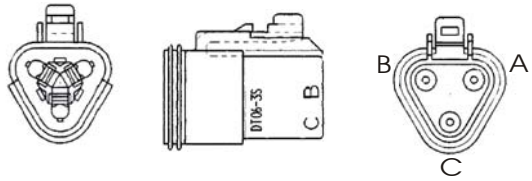
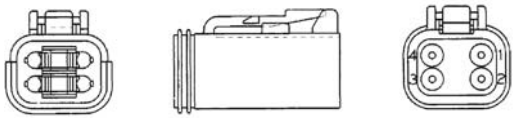
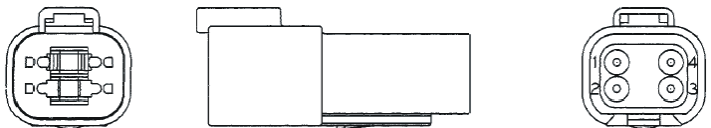
ID	Description	Diagram
DHD14R	Deutsch 14 position HD series alum. Receptacle	 <p>Rear View</p>
DHTP31R (receptacle) DHTP31P (plug)	Deutsch HDP 31 position	 <p>Socket Rear Insert</p>
DT02P	Deutsch 2 position DT series plug	
DT02R	Deutsch 2 position DT series receptacle	
DT03P	Deutsch 3 position DT series plug	
DT04P	Deutsch 4 position DT series plug	
DT04R	Deutsch 4 position DT series receptacle	

Table 7-11. Connector Loading Diagrams

ID	Description	Diagram
DT06AP	Deutsch 6 position DT series plug	
DT06R	Deutsch 6 position DT series receptacle	
DT08AP	Deutsch 8 position DT series plug	
DT08AR	Deutsch 8 position DT series receptacle	
DT12AP	Deutsch 12 position DT series plug	
DT12AR	Deutsch 12 position DT series receptacle	

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Table 7-11. Connector Loading Diagrams

ID	Description	Diagram
DTM04P	Deutsch 4 position DTM series mini plug	
DTM04R	Deutsch 4 position DTM series mini receptacle	
DTM12AP	Deutsch 12 position DT series mini plug with A key	
DTM12BP	Deutsch 12 position DT series mini plug with B key	
DTP02P	Deutsch 2 position DTP series plug	
DTP02R	Deutsch 2 position DTP series receptacle	
E06P	Eaton Toggle Switch	

Table 7-11. Connector Loading Diagrams

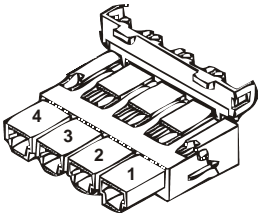

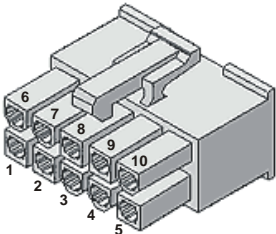
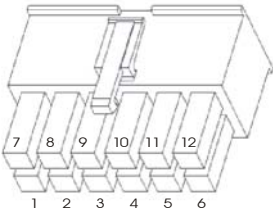
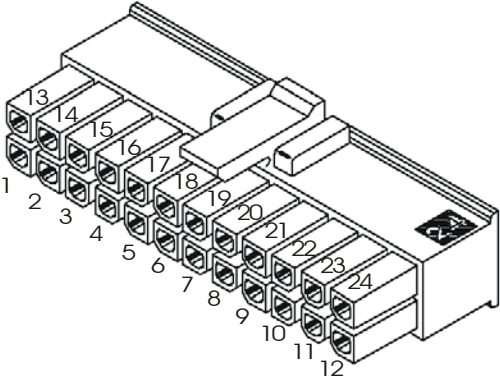
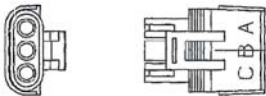
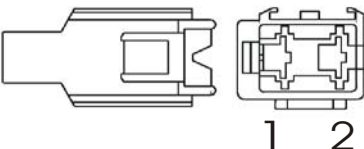
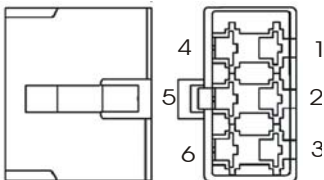
ID	Description	Diagram
M04P	Molex 4 position	
MMF08P	Molex Mini Fit 8 position plug	 Rear View
MMF10P	Molex Mini Fit 10 position plug	
MMF12P	Molex Mini Fit 12 position plug	
MMF16P	Molex Mini Fit 16 position plug	

Table 7-11. Connector Loading Diagrams

ID	Description	Diagram
PWP03P	Packard 3 position receptacle	
SUM02N	Sumitomo 2 position natural	
SUM06N	Sumitomo 6 position natural	

7.6 WORKING WITH AMP CONNECTORS

Applying Silicone Dielectric Compound to AMP Connectors

Silicone Dielectric Compound must be used on the AMP connections for the following reasons:

- To prevent oxidation at the mechanical joint between male and female pins.
- To prevent electrical malfunction caused by low level conductivity between pins when wet.

Use the following procedure to apply Silicone Dielectric Compound to the electrical connectors.

1. To prevent oxidation and low level conductivity, silicone dielectric grease must be packed completely around male and female pins on the inside of the connector after the mating of the housing to the header. This is easily achieved by using a syringe to fill the header with silicone dielectric compound, to a point just above the top of the male pins inside the header. When assembling the housing to the header, it is possible that the housing will become air locked, thus preventing the housing latch from engaging.
2. Pierce one of the unused wire seals to allow the trapped air inside the housing to escape.
3. Install a hole plug into this and/or any unused wire seal that has silicone dielectric compound escaping from it.

Assembly

Check to be sure the wedge lock is in the open, or as-shipped, position (See Figure 7-6.). Proceed as follows:

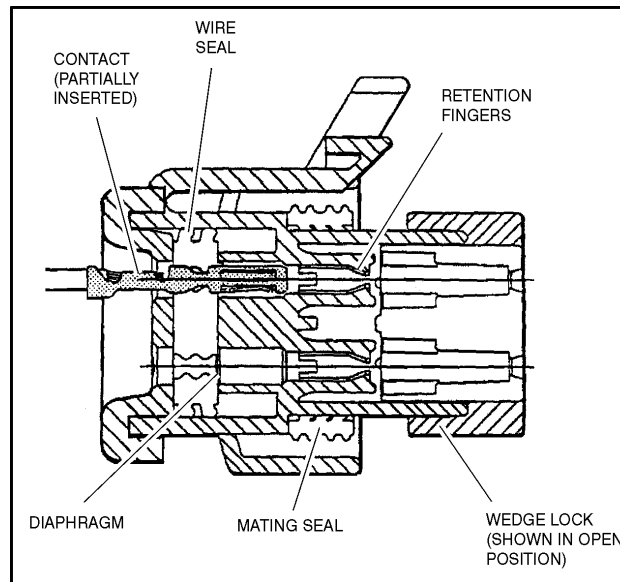


Figure 7-6. Connector Assembly Figure 1

1. To insert a contact, push it straight into the appropriate circuit cavity as far as it will go (See Figure 7-8.).
2. Pull back on the contact wire with a force of 1 or 2 lbs. to be sure the retention fingers are holding the contact (See Figure 7-8.).

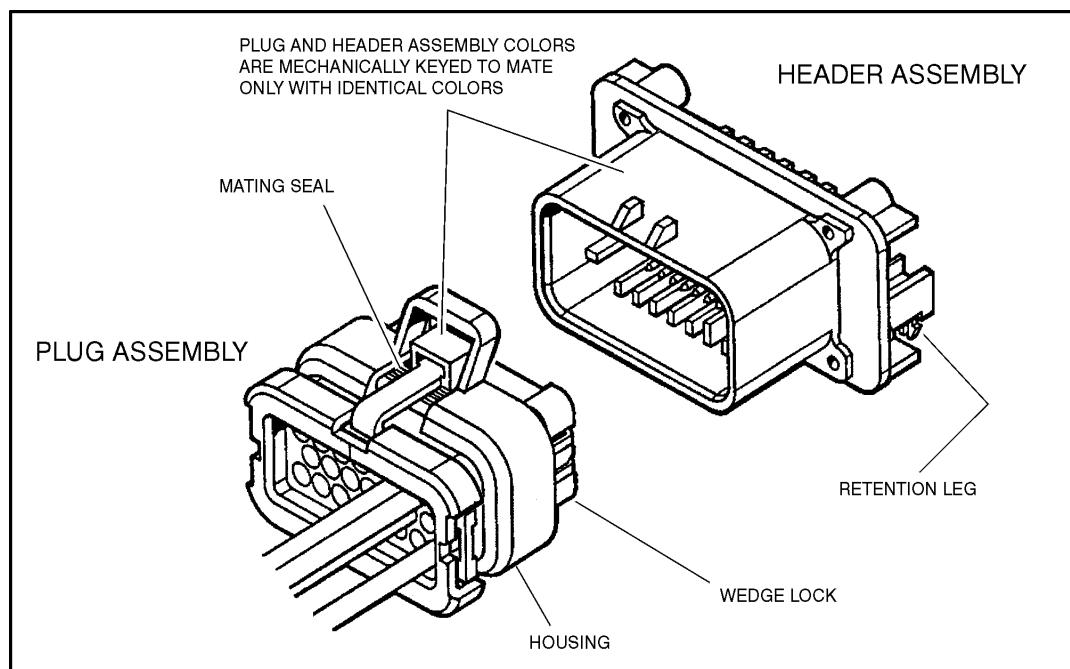


Figure 7-7. AMP Connector

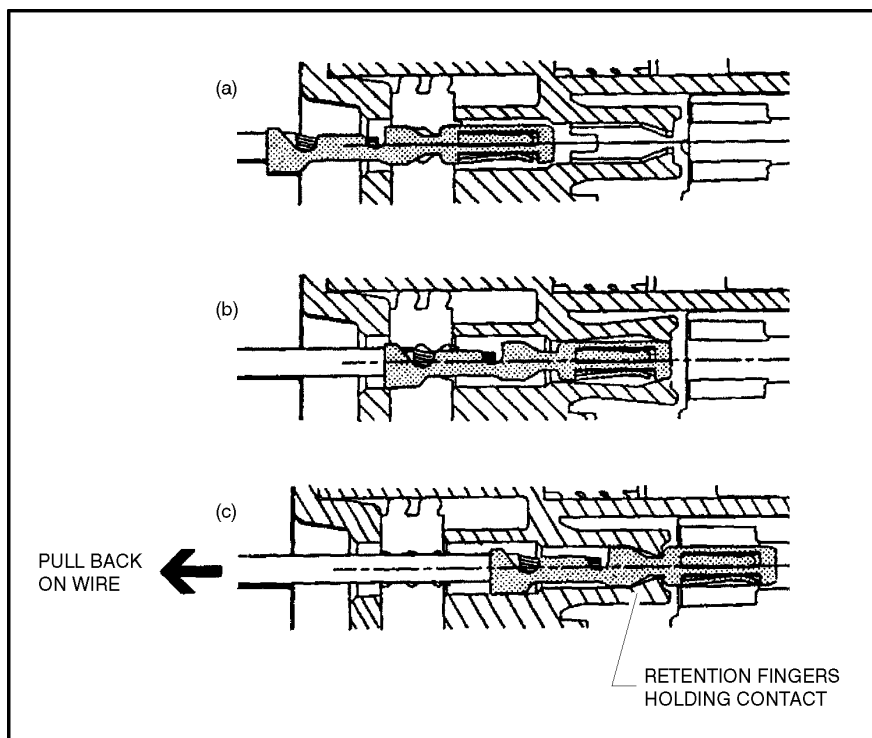


Figure 7-8. Connector Assembly Figure 2

3. After all required contacts have been inserted, the wedge lock must be closed to its locked position. Release the locking latches by squeezing them inward (See Figure 7-9.).

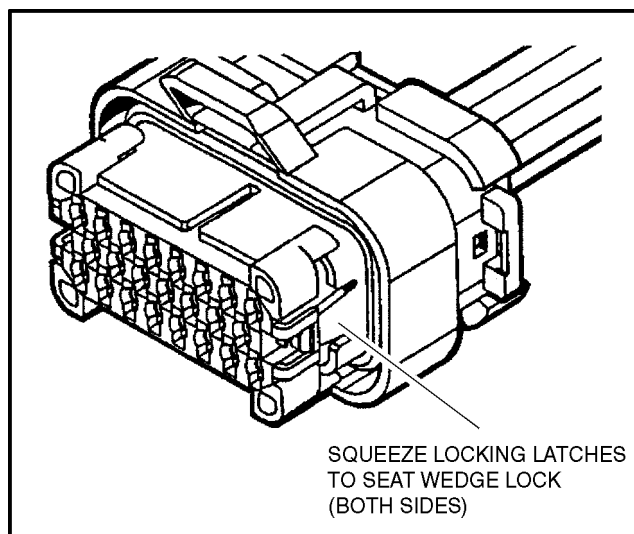


Figure 7-9. Connector Assembly Figure 3

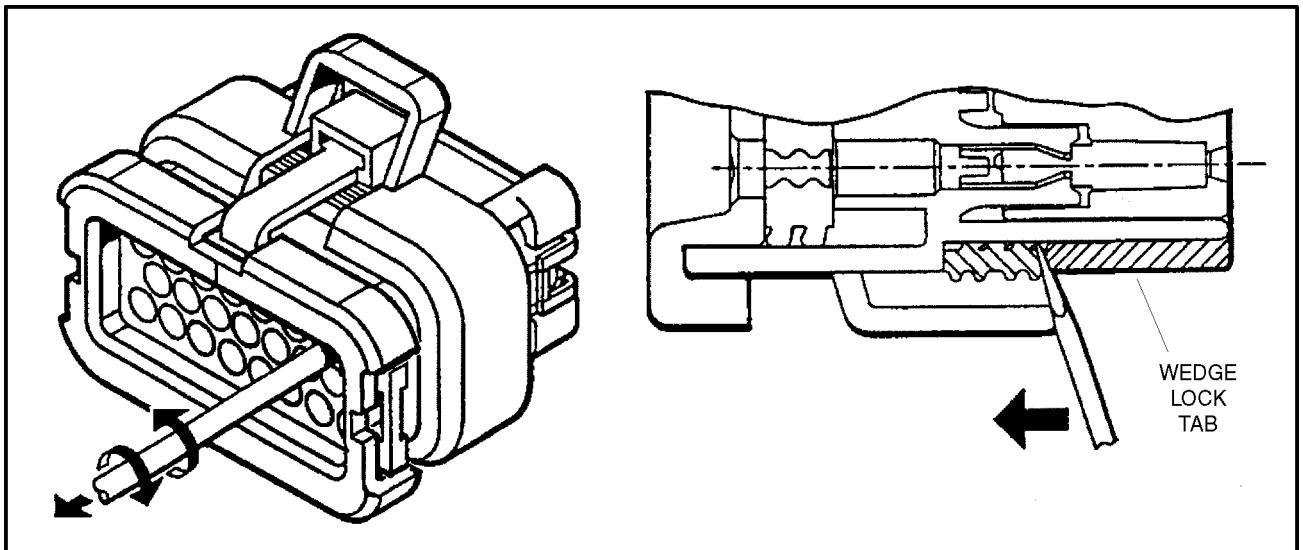


Figure 7-11. Connector Disassembly

4. Slide the wedge lock into the housing until it is flush with the housing (See Figure 7-10.).

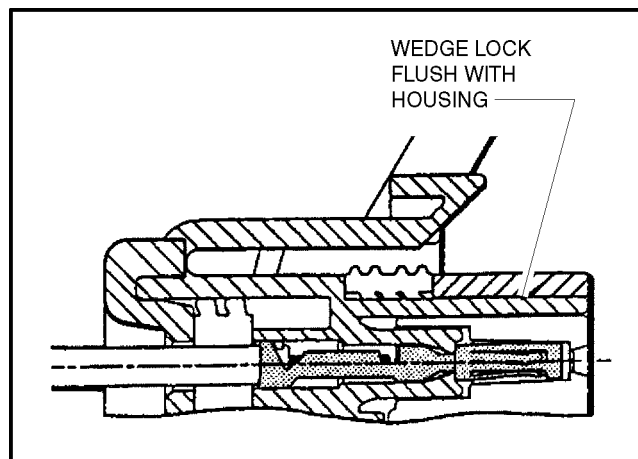


Figure 7-10. Connector Assembly Figure 4

Disassembly

1. Insert a 4.8 mm (3/16") wide screwdriver blade between the mating seal and one of the red wedge lock tabs.
2. Pry open the wedge lock to the open position.
3. While rotating the wire back and forth over a half turn (1/4 turn in each direction), gently pull the wire until the contact is removed.

NOTE: The wedge lock should never be removed from the housing for insertion or removal of the contacts.

Wedge Lock

The wedge lock has slotted openings in the forward, or mating end. These slots accommodate circuit testing in the field, by using a flat probe such as a pocket knife. DO NOT use a sharp point such as an ice pick.

Service - Voltage Reading

⚠ CAUTION

DO NOT PIERCE WIRE INSULATION TO TAKE VOLTAGE READINGS.

It has been common practice in electrical troubleshooting to probe wires by piercing the insulation with a sharp point. This practice should be discouraged when dealing with the AMPSEAL plug assembly, or any other sealed connector system. The resulting pinholes in the insulation will allow moisture to invade the system by traveling along the wire strands. This nullifies the effectiveness of the connector seals and could result in system failure.

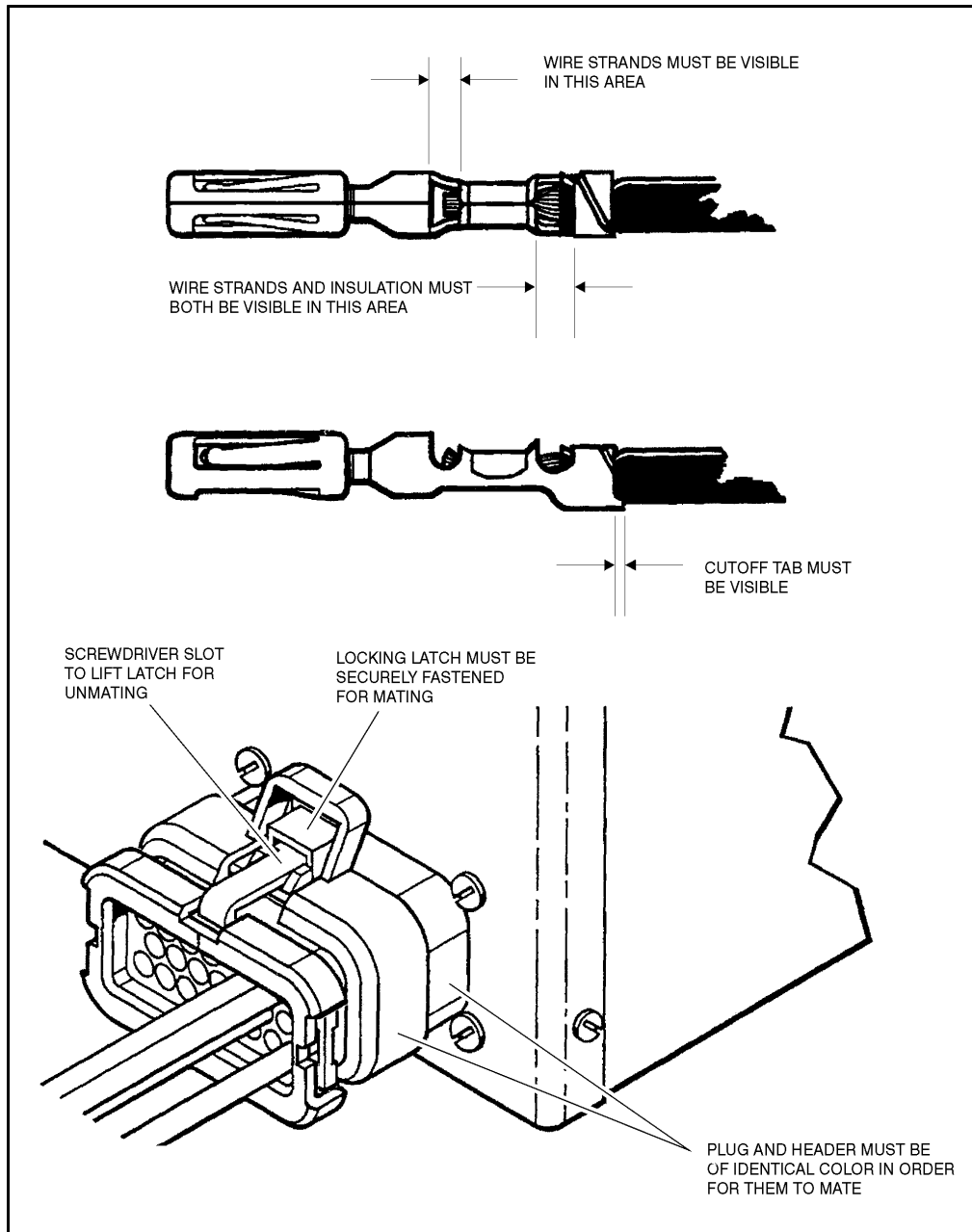


Figure 7-12. Connector Installation

7.7 WORKING WITH DEUTSCH CONNECTORS

DT/DTP Series Assembly

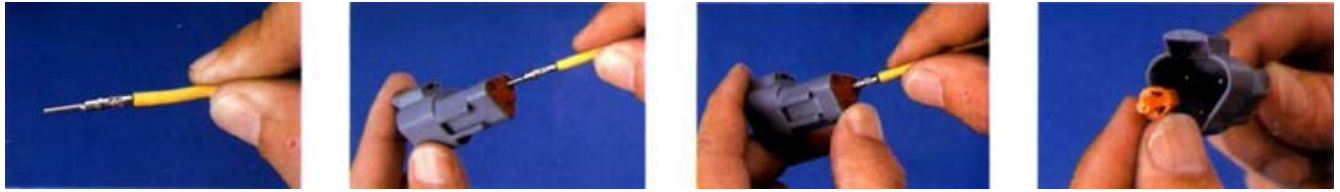


Figure 7-13. DT/DTP Contact Installation

1. Grasp crimped contact about 25mm behind the contact barrel.
2. Hold connector with rear grommet facing you.
3. Push contact straight into connector grommet until a click is felt. A slight tug will confirm that it is properly locked in place.
4. Once all contacts are in place, insert wedgelock with arrow pointing toward exterior locking mechanism. The wedge-lock will snap into place. Rectangular wedges are not oriented. They may go in either way.

NOTE: The receptacle is shown - use the same procedure for plug.

DT/DTP Series Disassembly



Figure 7-14. DT/DTP Contact Removal

1. Remove wedgelock using needlenose pliers or a hook shaped wire to pull wedge straight out.
2. To remove the contacts, gently pull wire backwards, while at the same time releasing the locking finger by moving it away from the contact with a screwdriver.
3. Hold the rear seal in place, as removing the contact may displace the seal.

HD30/HDP20 Series Assembly



Figure 7-15. HD/HDP Contact Installation

1. Grasp contact about 25mm behind the contact crimp barrel.
2. Hold connector with rear grommet facing you.

SECTION 7 - ELECTRICAL REFERENCE

3. Push contact straight into connector grommet until a positive stop is felt. A slight tug will confirm that it is properly locked in place.

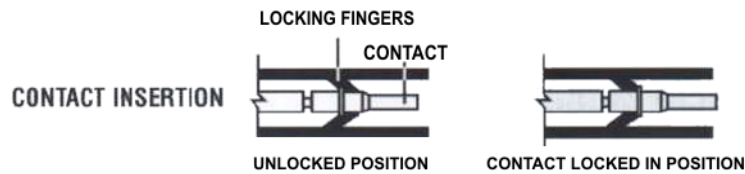


Figure 7-16. HD/HDP Locking Contacts Into Position

NOTE: For unused wire cavities, insert sealing plugs for full environmental sealing

HD30/HDP20 Series Disassembly



Figure 7-17. HD/HDP Contact Removal

1. With rear insert toward you, snap appropriate size extractor tool over the wire of contact to be removed.
2. Slide tool along into the insert cavity until it engages contact and resistance is felt.
3. Pull contact-wire assembly out of connector.

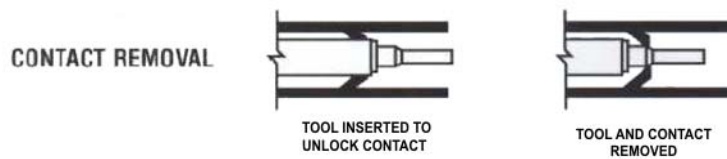


Figure 7-18. HD/HDP Unlocking Contacts

NOTE: Do Not twist or insert tool at an angle.

7.8 TRAILER WIRING

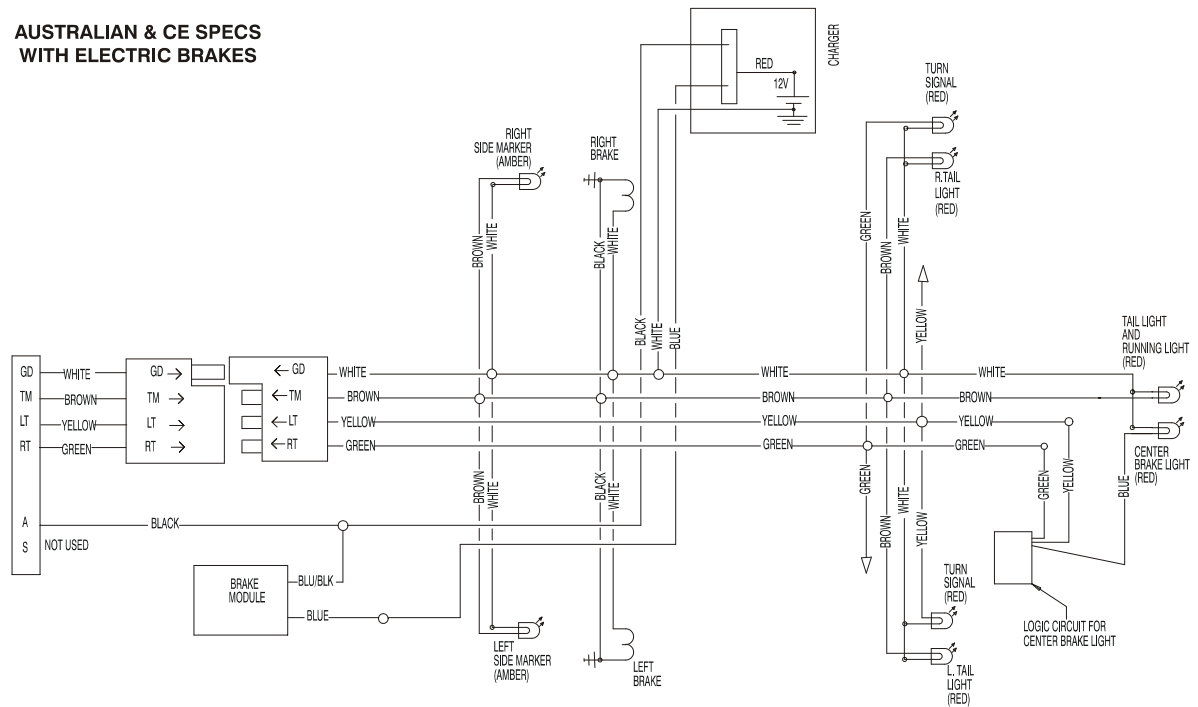
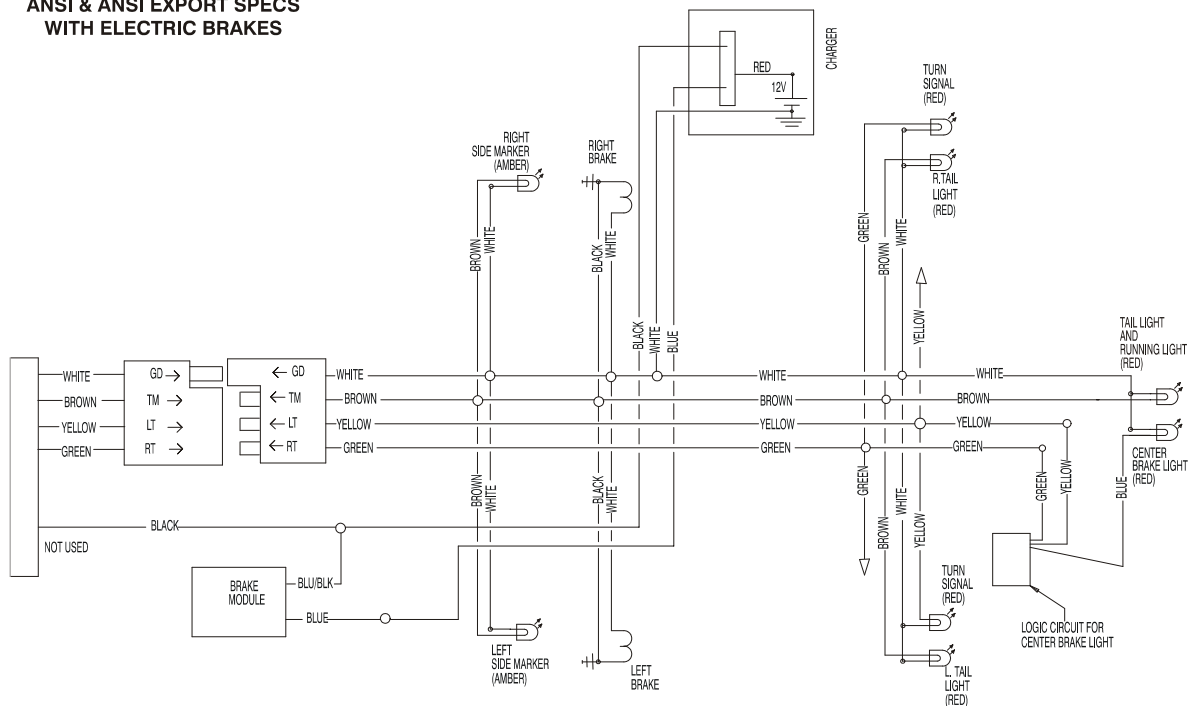
AUSTRALIAN & CE SPECS
WITH ELECTRIC BRAKESANSI & ANSI EXPORT SPECS
WITH ELECTRIC BRAKES

Figure 7-19. Electrical Schematic (Trailer)

SECTION 8. HYDRAULIC REFERENCES

8.1 SOLENOIDS

Connector	Function	Nominal Resistance (Ohms)
X077	Swing Left	8.0
X078	Swing Right	8.0
X079	Jib Up (T500J)	8.0
X056	Jib Down (T500J)	9.8
X080	Level Up	8.0
X081	Level Down	8.0
X082	Telescope Out	8.0
X083	Telescope In	8.0
X084	Lift Up	8.0
X039	Lift Down	9.8
X085	Outrigger Stow	8.0
X086	Outrigger Set	8.0
X087	Dump Valve (Engine Powered)	6.0
X046	Front Left Outrigger	7.2
X047	Front Right Outrigger	7.2
X048	Rear Left Outrigger	7.2
X049	Rear Right Outrigger	7.2
X067	Drive Left Forward Solenoid	9.8
X068	Drive Right Forward Solenoid	9.8
X069	Drive Left Reverse Solenoid	9.8
X070	Drive Right Reverse Solenoid	9.8
X071	Drive Enable Solenoid	7.2

8.2 MINIMUM OPERATING PRESSURE

Function	T350 Minimum Pressure For Operation	T500J Minimum Pressure For Operation
Swing Left	Min. Swing Left Pressure psi (bar)	Min. Swing Left Pressure psi (bar)
Swing Right	Min. Swing Right Pressure psi (bar)	Min. Swing Right Pressure psi (bar)
Jib Up (T500J)	Min. Jib Up Pressure psi (bar)	Min. Jib Up Pressure psi (bar)
Jib Down (T500J)	Min. Jib Down Pressure psi (bar)	Min. Jib Down Pressure psi (bar)
Level Up	Min. Level Up Pressure psi (bar)	Min. Level Up Pressure psi (bar)
Level Down	Min. Level Down Pressure psi (bar)	Min. Level Down Pressure psi (bar)
Telescope Out	Min. Tele Out Pressure psi (bar)	Min. Tele Out Pressure psi (bar)
Telescope In	Min. Tele In Pressure psi (bar)	Min. Tele In Pressure psi (bar)
Lift Up	Min. Lift Up Pressure psi (bar)	Min. Lift Up Pressure psi (bar)
Lift Down	Min. Lift Down Pressure psi (bar)	Min. Lift Down Pressure psi (bar)
Outrigger Stow	Min. O/R Stow Pressure psi (bar)	Min. O/R Stow Pressure psi (bar)
Outrigger Set	Min. O/R Set Pressure psi (bar)	Min. O/R Set Pressure psi (bar)

*These values not available at time of printing

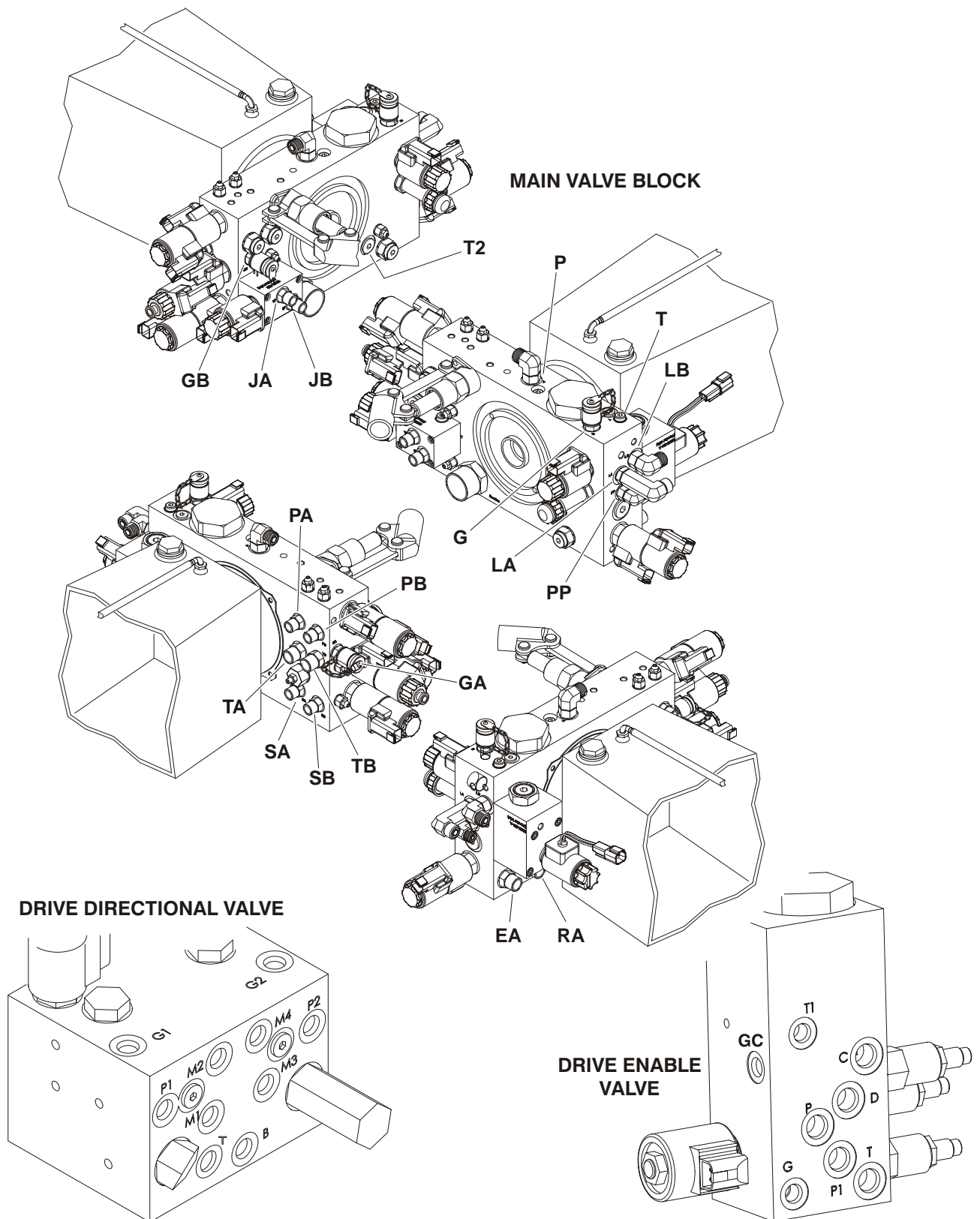


Figure 8-1. Hydraulic Test Ports

SECTION 8 - HYDRAULIC REFERENCES

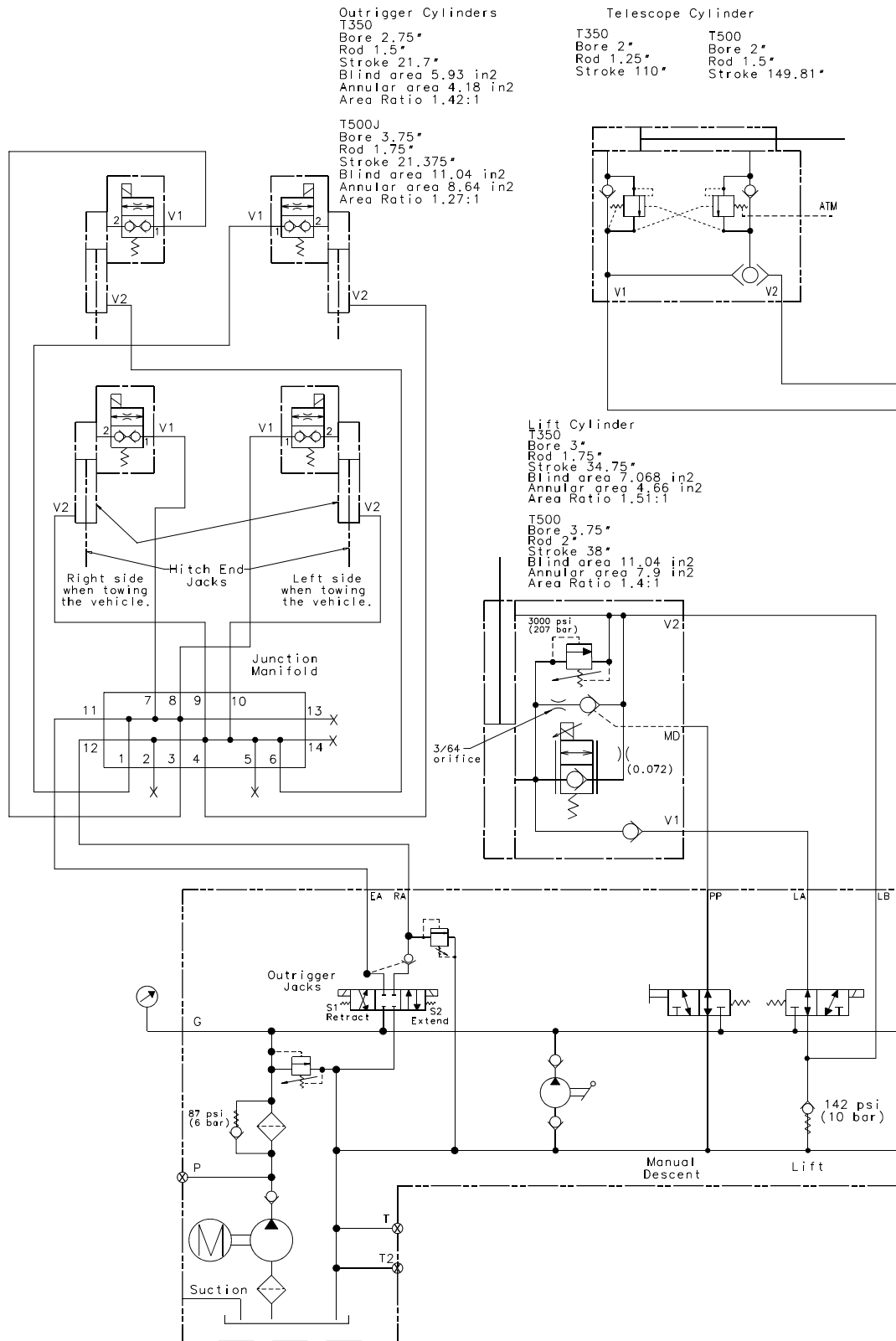
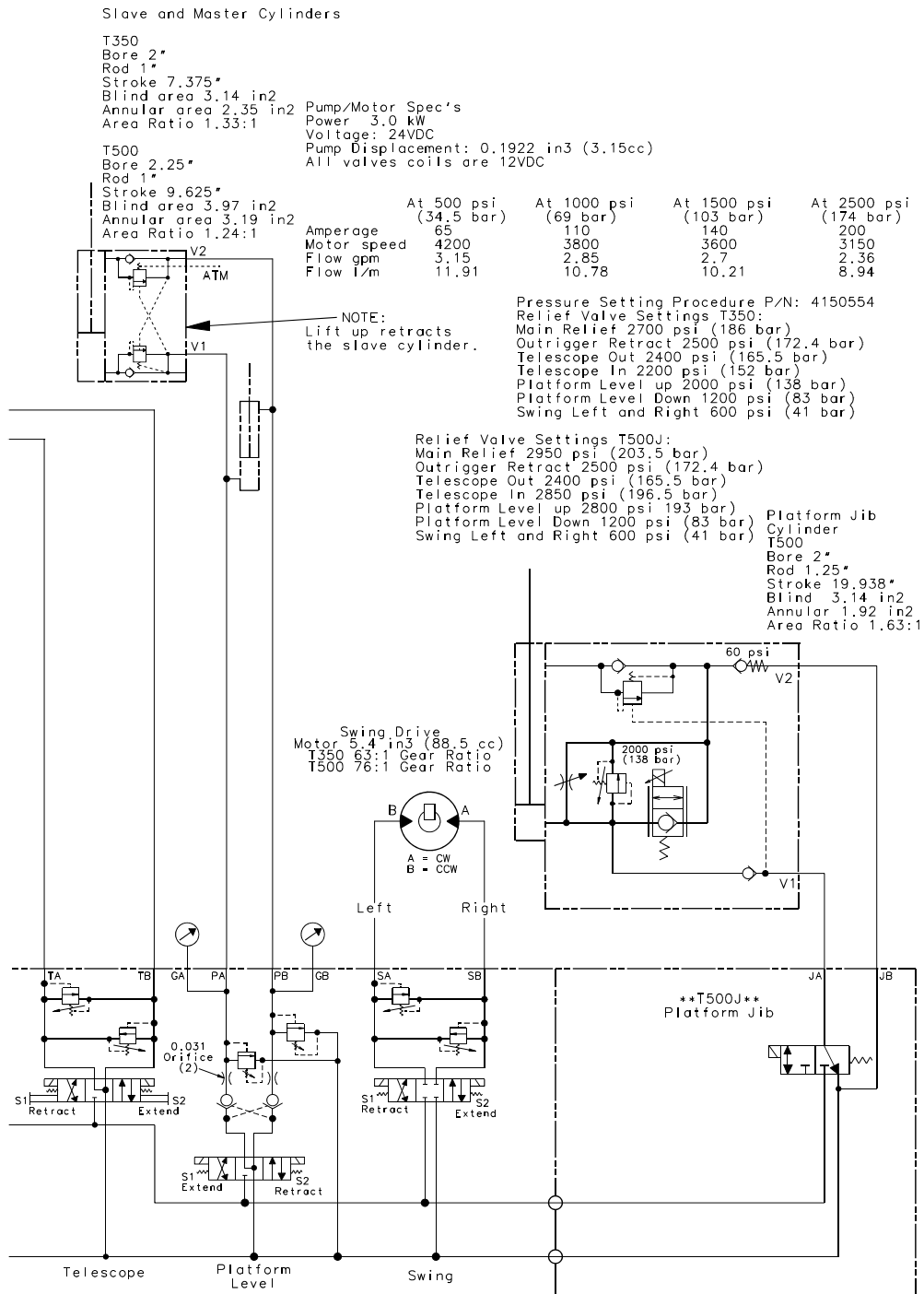


Figure 8-2. Hydraulic Schematic - Electric Powered Machines (Sheet 1 of 2)



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Figure 8-3. Hydraulic Schematic - Electric Powered Machines (Sheet 2 of 2)

SECTION 8 - HYDRAULIC REFERENCES

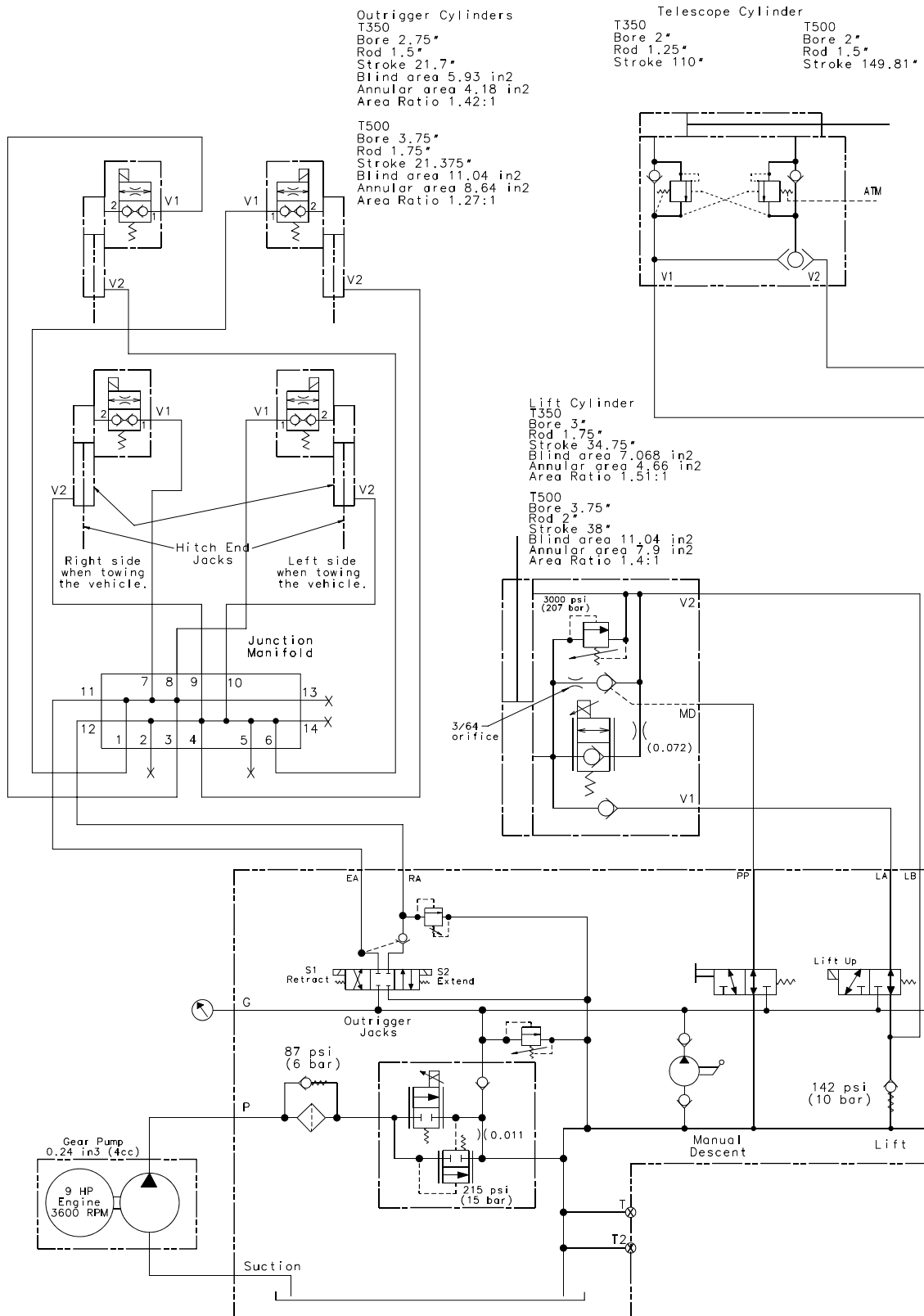
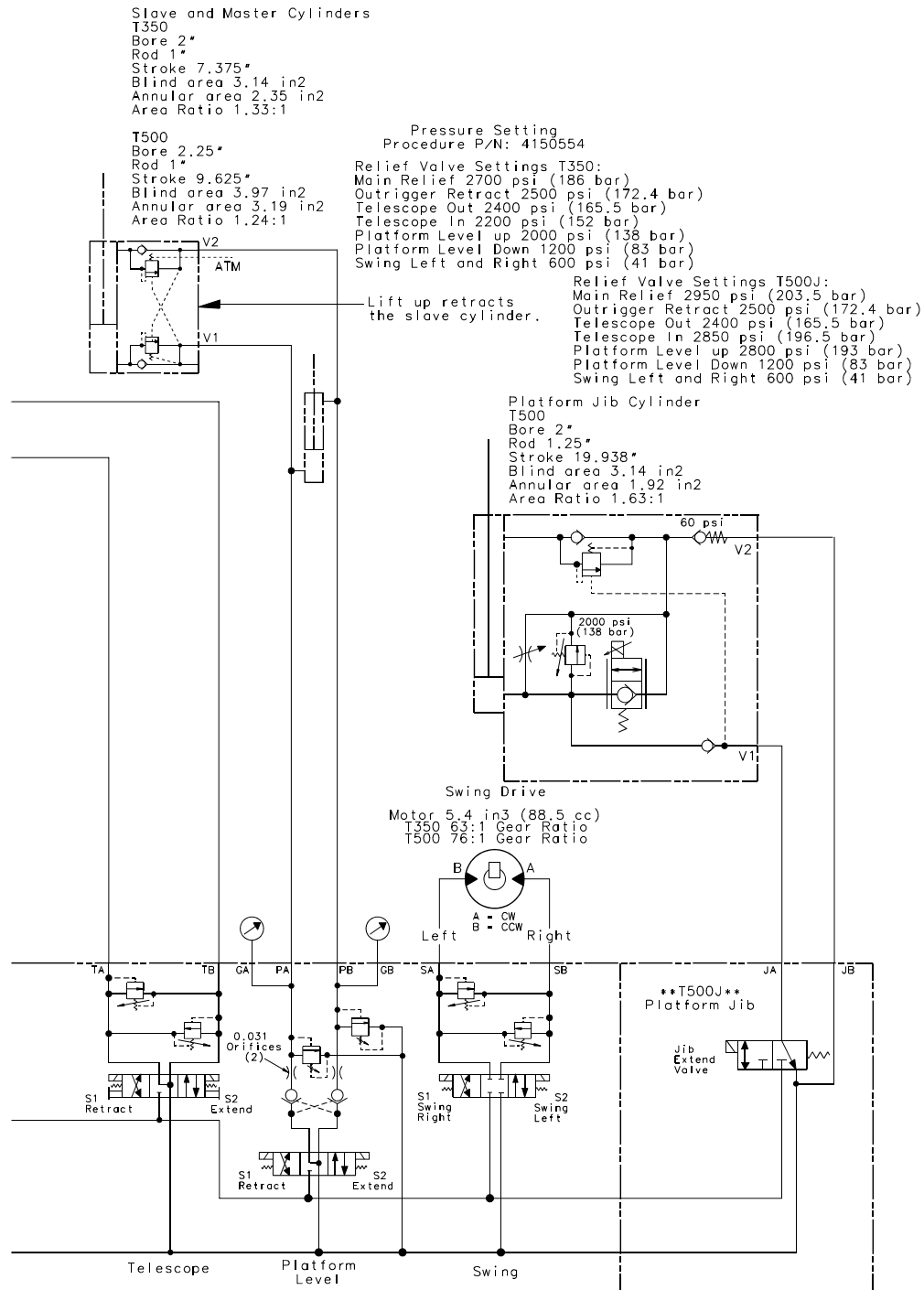


Figure 8-4. Hydraulic Schematic - Engine Powered Machines (Sheet 1 of 2)



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Figure 8-5. Hydraulic Schematic - Engine Powered Machines (Sheet 2 of 2)

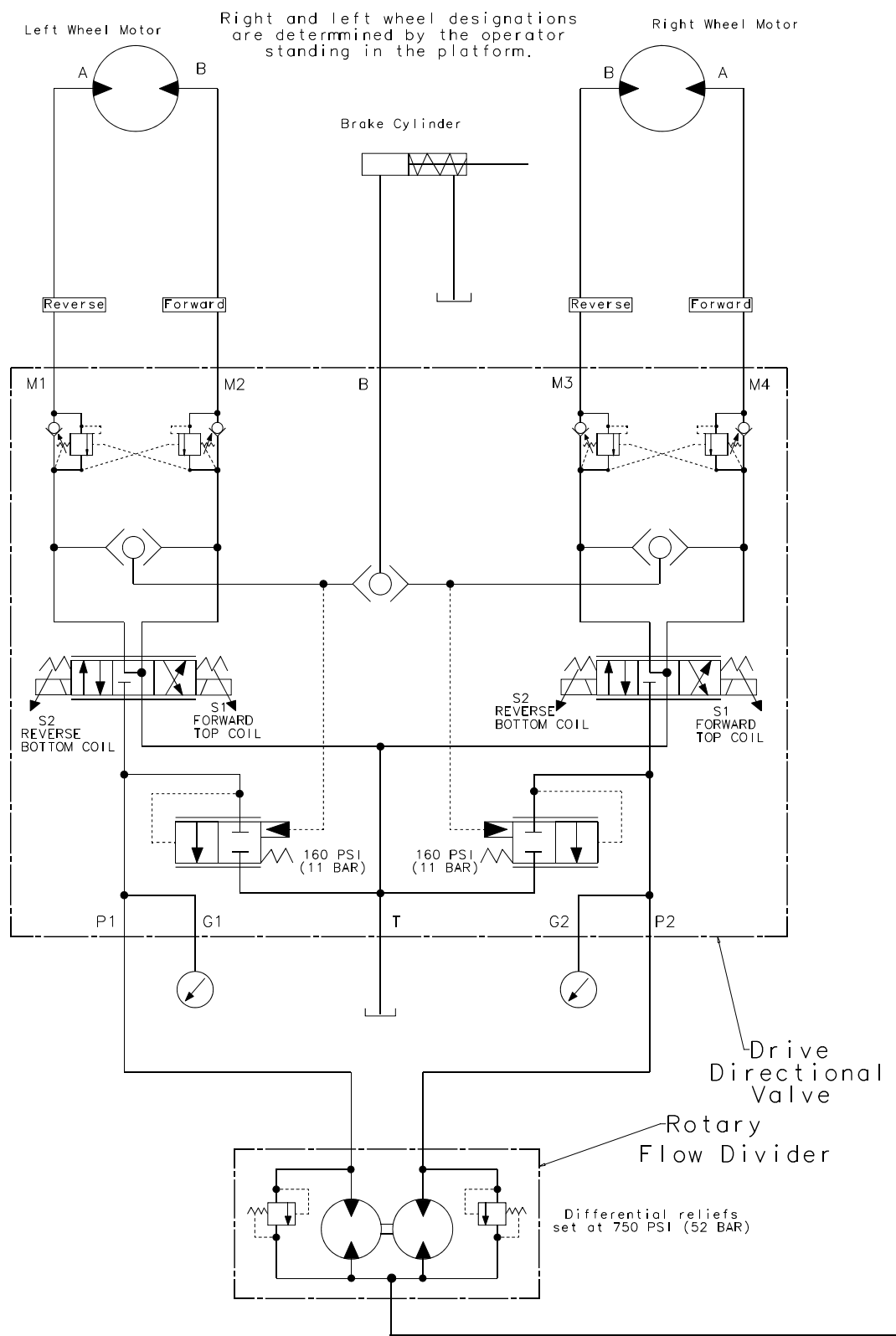
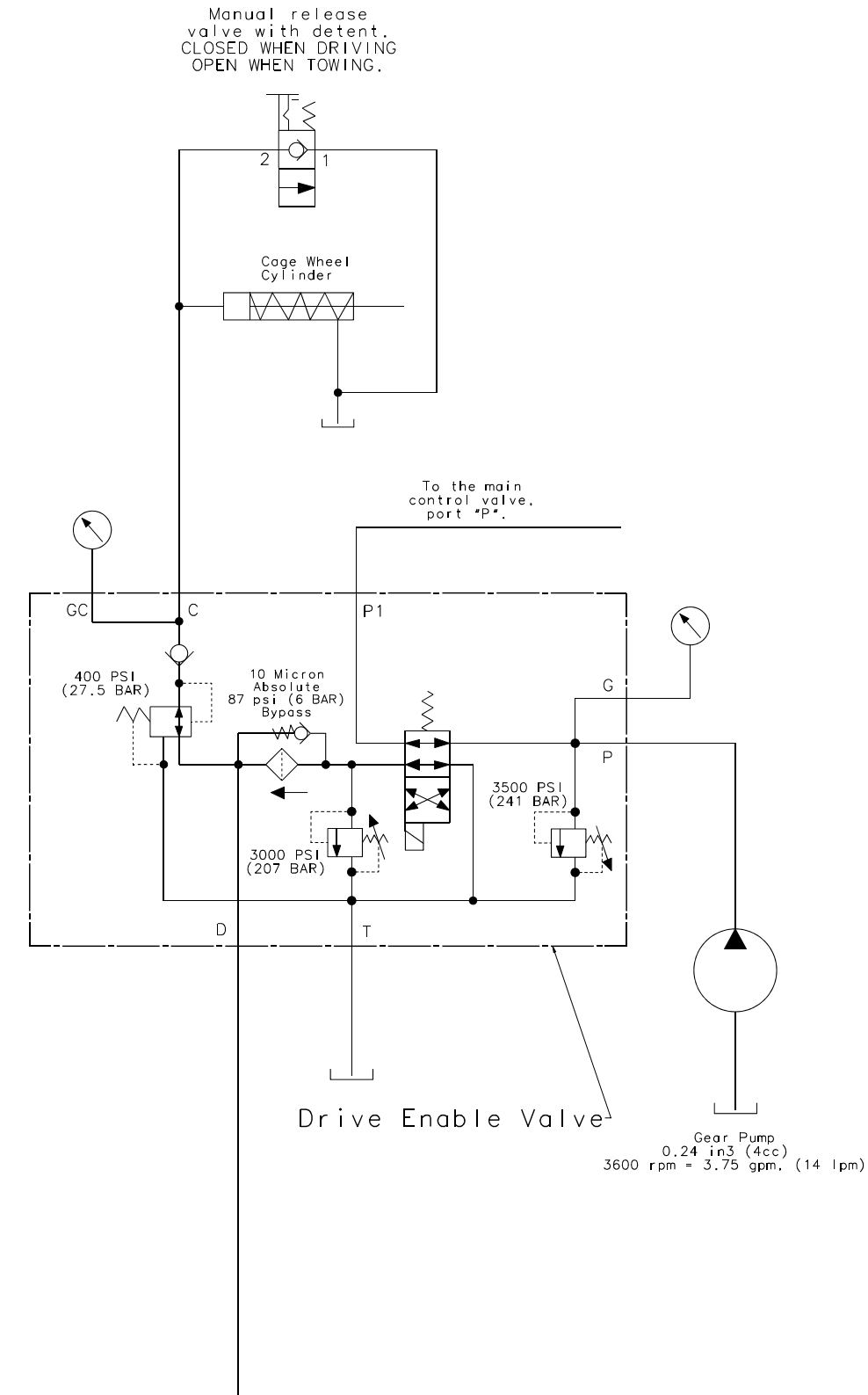


Figure 8-6. Hydraulic Schematic - Engine Powered Drive Option (Sheet 1 of 2)



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Figure 8-7. Hydraulic Schematic - Engine Powered Drive Option (Sheet 2 of 2)

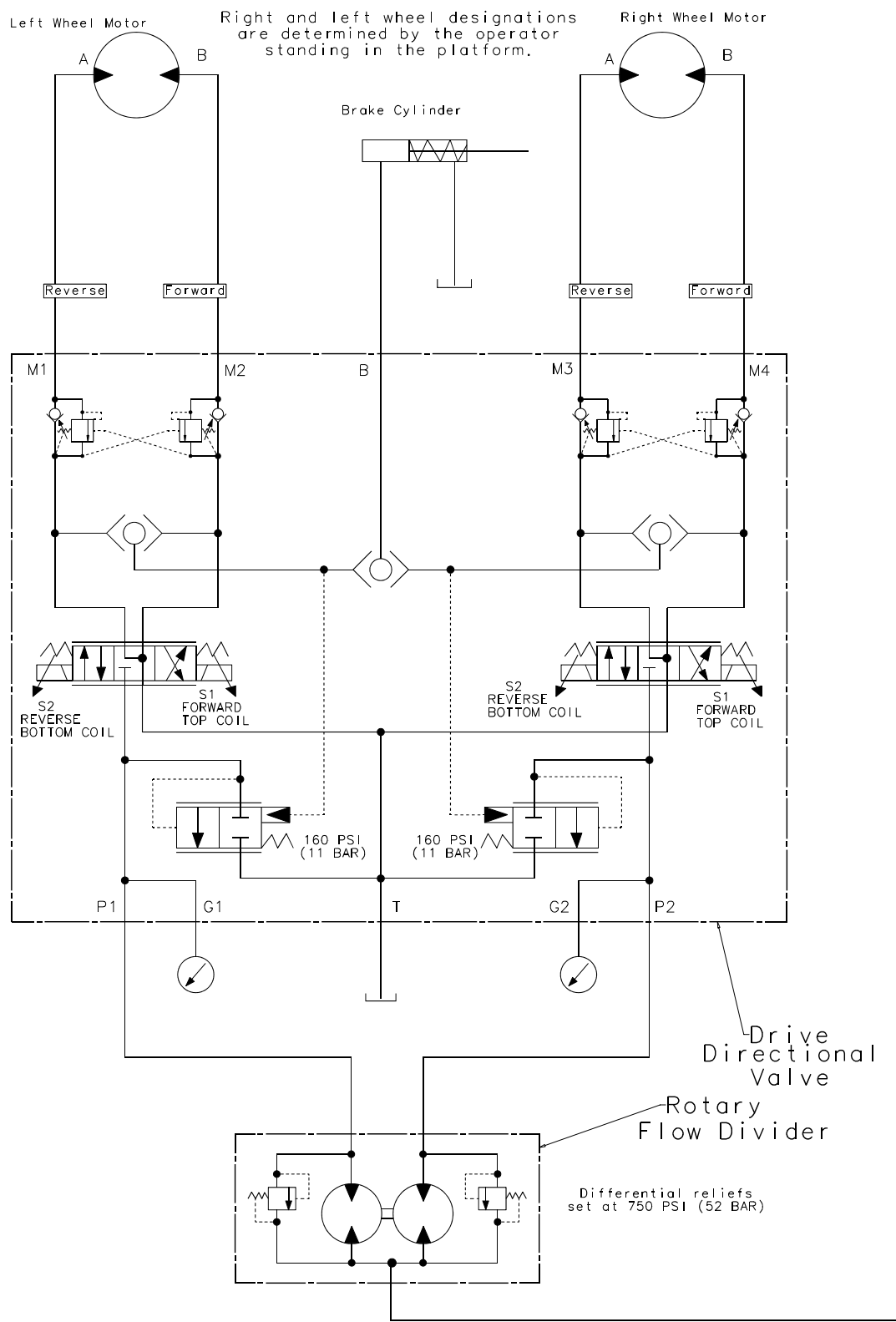


Figure 8-8. Hydraulic Schematic - Electric Powered Drive Option (Sheet 1 of 2)

SECTION 8 - HYDRAULIC REFERENCES

SECTION 9. JLG ANALYZER

9.1 INTRODUCTION

The JLG Control System controller has a built in LED to indicate any faults. The system stores recent faults which may be accessed for troubleshooting.

The Control System may be accessed utilizing a custom designed, hand held analyzer (Analyzer Kit, JLG part no. 2901443) which will display two lines of information at a time, by scrolling through the program.

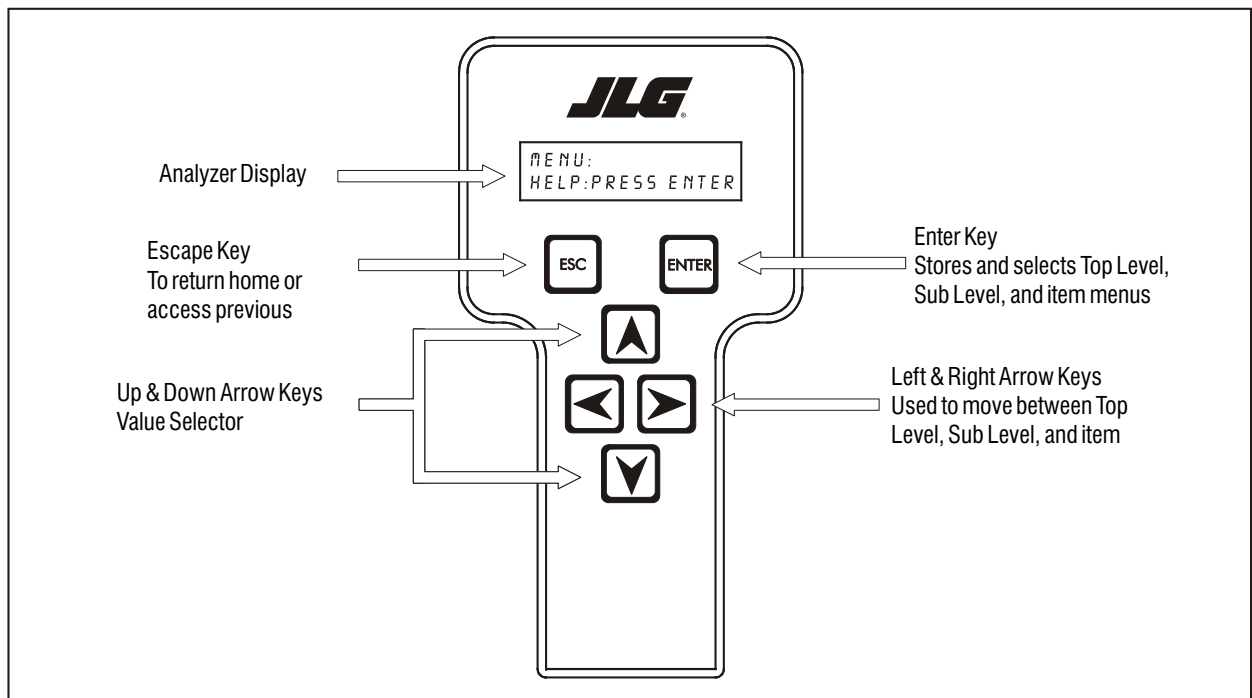


Figure 9-1. Hand Held Analyzer

9.2 TO CONNECT THE JLG CONTROL SYSTEM ANALYZER

1. Connect the cable supplied with the analyzer, to the controller module in the ground control box and connect the remaining end of the cable to the analyzer.

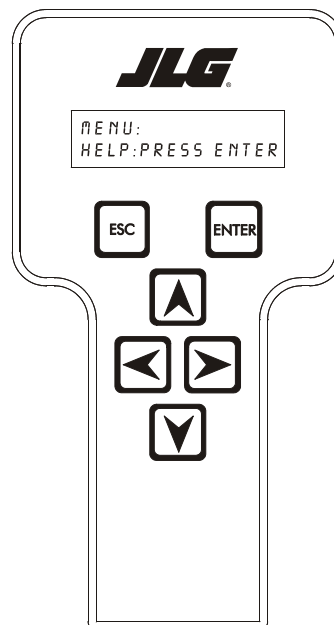


NOTE: The cable has a four pin connector at each end of the cable; the cable cannot be connected backwards.

2. Power up the Control System by turning the key to the ground position and pulling the emergency stop button on.

9.3 USING THE ANALYZER

With the machine power on and the analyzer connected properly, the analyzer will display the following:



HELP:
PRESS ENTER

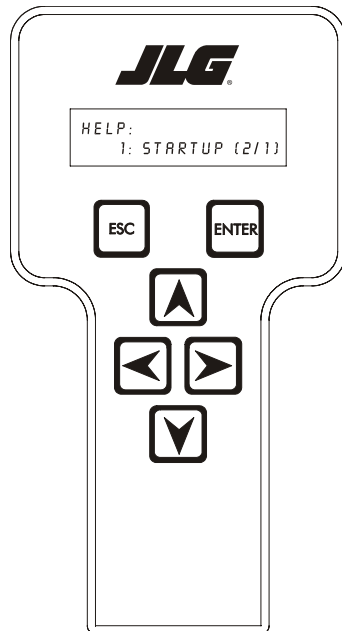
At this point, using the **RIGHT** and **LEFT** arrow keys, you can move between the top level menu items. To select a displayed menu item, press **ENTER**. To cancel a selected menu item, press **ESC**; then you will be able to scroll using the right and left arrow keys to select a different menu item.

The top level menus are as follows:

HELP
DIAGNOSTICS
SYSTEM TEST
ACCESS LEVEL
PERSONALITIES
MACHINE SETUP
CALIBRATIONS (view only)

If you press **ENTER**, at the **HELP: PRESS ENTER** display, and a fault is present, the analyzer display will scroll the fault across the screen. If there was no fault detected, the display will read: **HELP: EVERYTHING OK**. If powered up at the ground station, the display will read: **GROUND OK**.

If **ENTER** is pressed again, the display moves to the following display:



LOGGED HELP

1: POWER CYCLE (0/0)

At this point, the analyzer will display the last fault the system has seen, if any are present. You may scroll through the fault logs to view what the last 25 faults were. Use the right and left arrow keys to scroll through the fault logs. To return to the beginning, press **ESC**. two times. **POWER CYCLE (0/0)** indicates a power up.

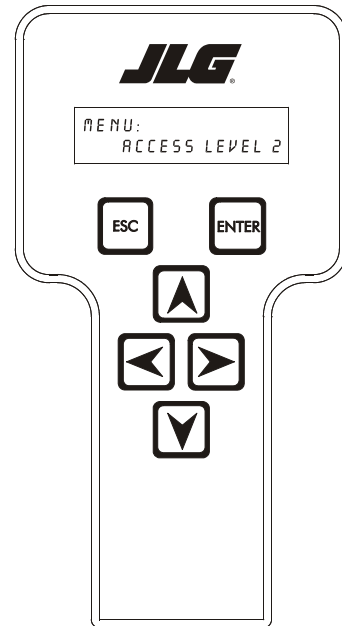
When a top level menu is selected, a new set of menu items may be offered: for example:

PLATFORM
GROUND
PUMP
ENGINE
SYSTEM
VALVES
DATALOG
VERSIONS

Pressing **ENTER** with any of the above displayed menus, will display additional sub-menus within the selected menu. In some cases, such as **DRIVE**, the next level is the parameter or information to be changed. Refer to the flow chart for what menus are available within the top level menus. You may only view the personality settings for selected menus while in access level 2. Remember, you may always cancel a selected menu item by pressing the **ESC**. key.

9.4 CHANGING THE ACCESS LEVEL OF THE HAND HELD ANALYZER

When the analyzer is first connected, you will be in access level 2 which enables you to only view most settings which cannot be changed until you enter a password to advance to a lower level. This ensures that a setting cannot be accidentally altered. To change the access level, the correct password must be entered. To enter the password, scroll to the **ACCESS LEVEL** menu. For example:



MENU:
ACCESS LEVEL 2

Press **ENTER** to select the **ACCESS LEVEL** menu.

Using the **UP** or **DOWN** arrow keys, enter the first digit of the password, 3.

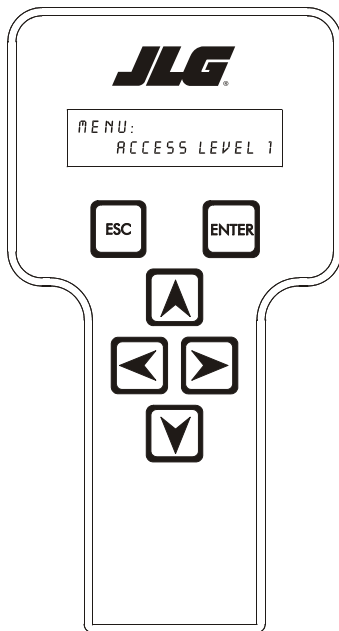
Then using the **RIGHT** arrow key, position the cursor to the right one space to enter the second digit of the password.

Use the **UP** or **DOWN** arrow key to enter the second digit of the password which is 33271.

Continue using the arrow keys until all the remaining digits of the password is shown.

SECTION 9 - JLG ANALYZER

Once the correct password is displayed, press **ENTER**. The access level should display the following, if the password was entered correctly:

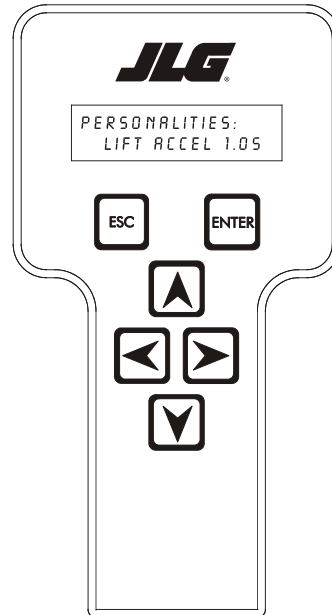


MENU:
ACCESS LEVEL 1

Repeat the above steps if the correct access level is not displayed or you can not adjust the personality settings.

9.5 ADJUSTING PARAMETERS USING THE HAND HELD ANALYZER

Once you have gained access to level 1, and a personality item is selected, press the UP or DOWN arrow keys to adjust its value, for example:

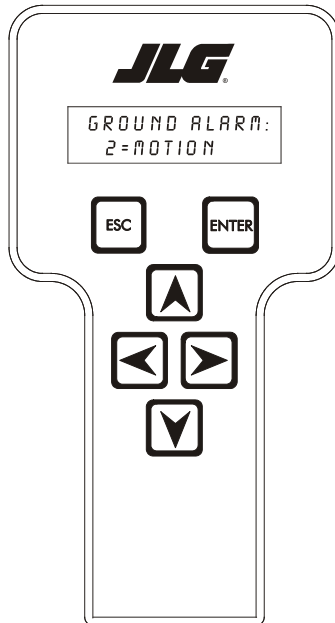


PERSONALITIES:
LIFT ACCEL 1.0s

There will be a minimum and maximum for the value to ensure efficient operation. The Value will not increase if the **UP** arrow is pressed when at the maximum value nor will the value decrease if the **DOWN** arrow is pressed and the value is at the minimum value for any particular personality. If the value does not change when pressing the up and down arrows, check the access level to ensure you are at access level 1.

9.6 MACHINE SETUP

When a machine digit item is selected, press the UP or DOWN arrow keys to adjust its value, for example:

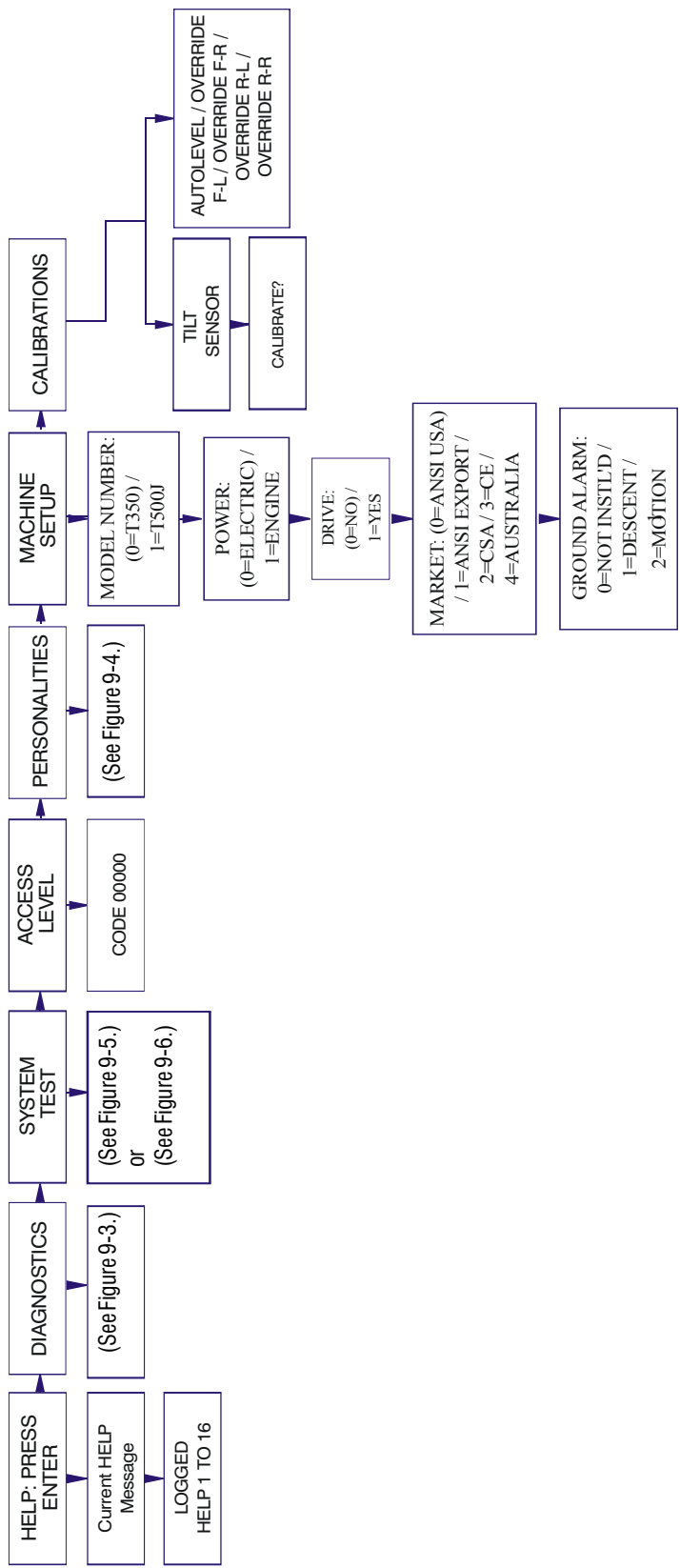


GROUND ALARM:
2 = MOTION

The effect of the machine digit value is displayed along with its value. The above display would be selected if the machine was equipped with a ground alarm and you wanted it to sound when lifting down. There are certain settings allowed to install optional features or select the machine model.

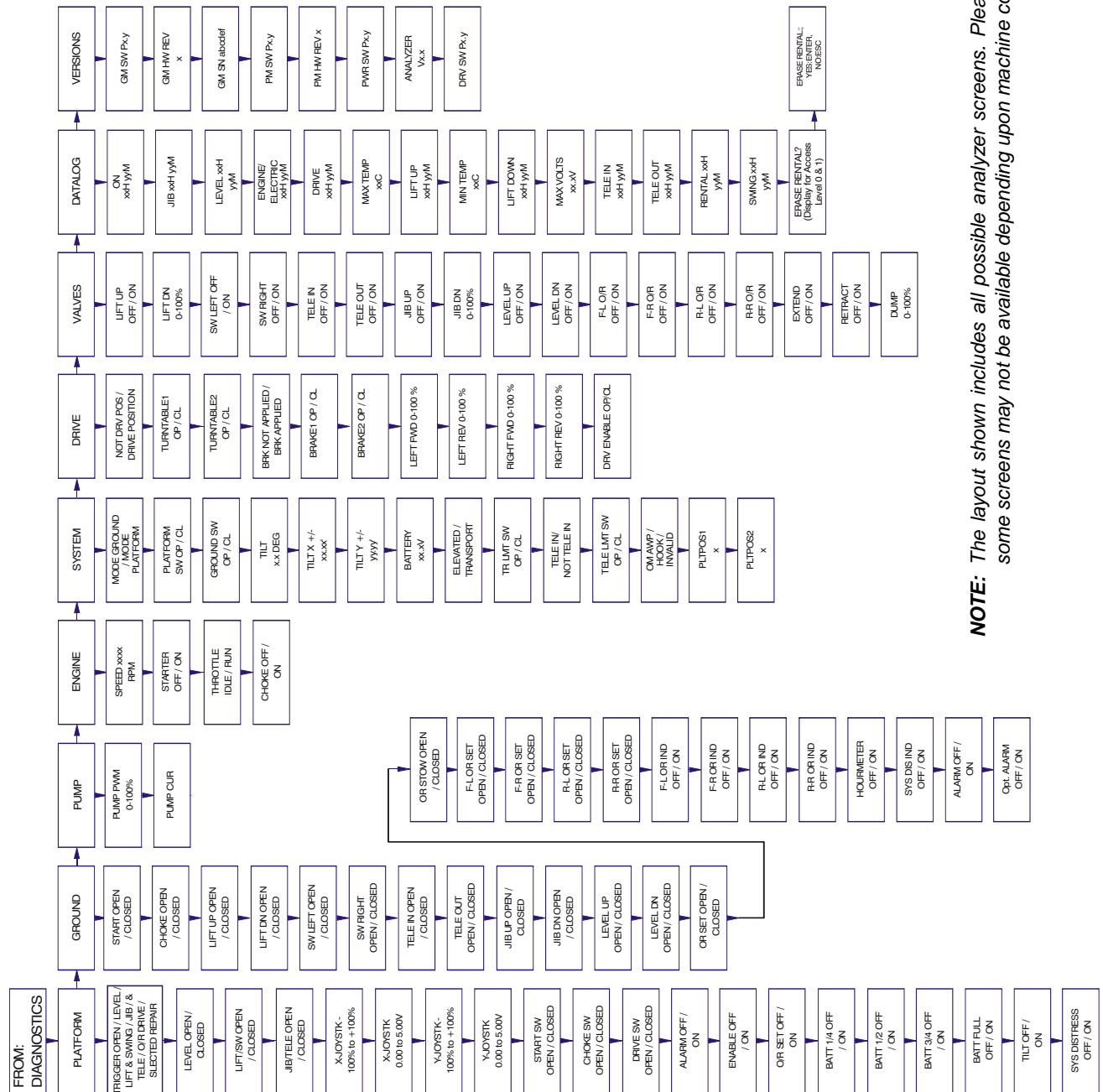
When selection the machine model to match the size of the machine, the personality settings will all default to the factory recommended setting.

NOTE: Password 33271 will give you access to level 1, which will permit you to change all machine personality settings.



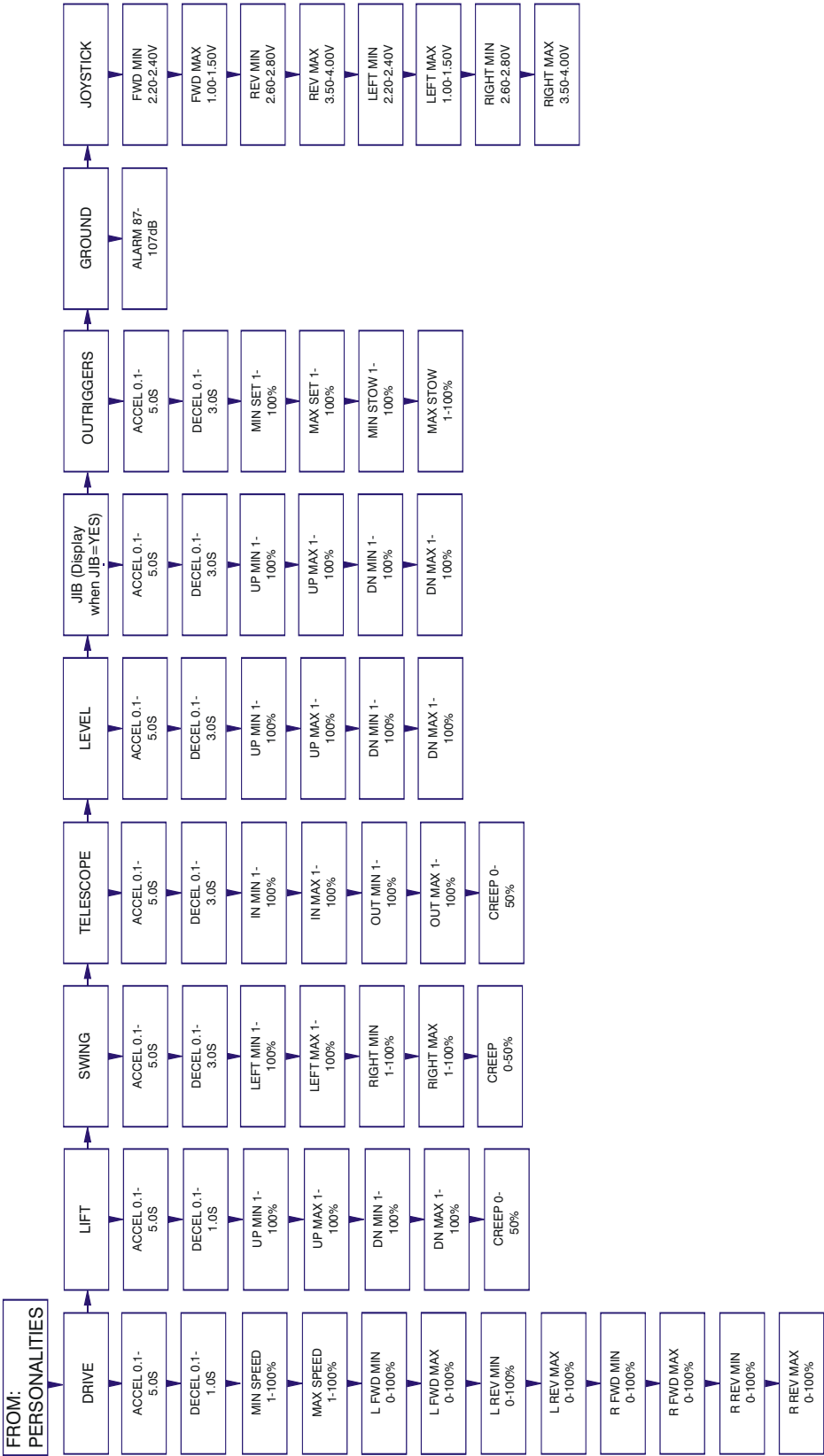
NOTE: The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.

Figure 9-2. Analyzer Flow Chart



NOTE: The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.

Figure 9-3. Analyzer Flow Chart - Diagnostics



NOTE: The layout shown includes all possible analyzer screens. Please note that some screens may not be available depending upon machine configuration.

Figure 9-4. Analyzer Flow Chart - Personalities

9.7 SYSTEM TEST

The Control System Incorporates a built-in system test to check the system components and functions. To use this function, use the following procedures.

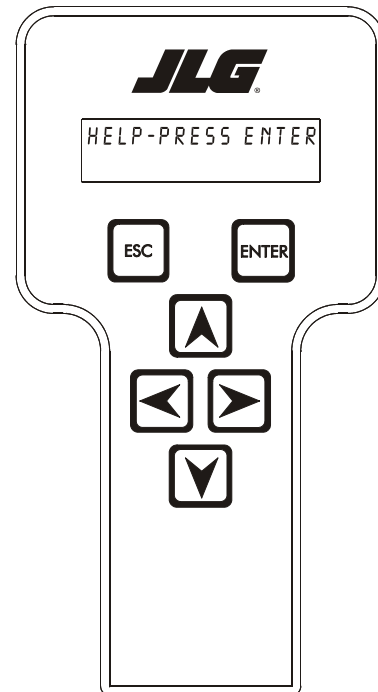
Platform Test

1. Position the Platform/Ground select switch to the Platform position.
2. Plug the analyzer into the connector at the base of the platform control box.



3. Pull out the Emergency Stop switch and Start the engine.

4. The analyzer screen should read:



5. Use the arrow button to reach SYSTEM TEST. Hit Enter. The analyzer will prompt you asking if you want to activate the system test; hit Enter again to activate.
6. Follow the flow path in Figure 9-5., System Test Flow Chart - Platform Tests and go through the component tests. Hit the ESC key during any part of the test to return to the main menu without completing all tests or wait until all tests are complete. During the TEST ALL INPUTS sequence, the analyzer allows control switches to be operated and shows if they are closed (CL) or open (OP).

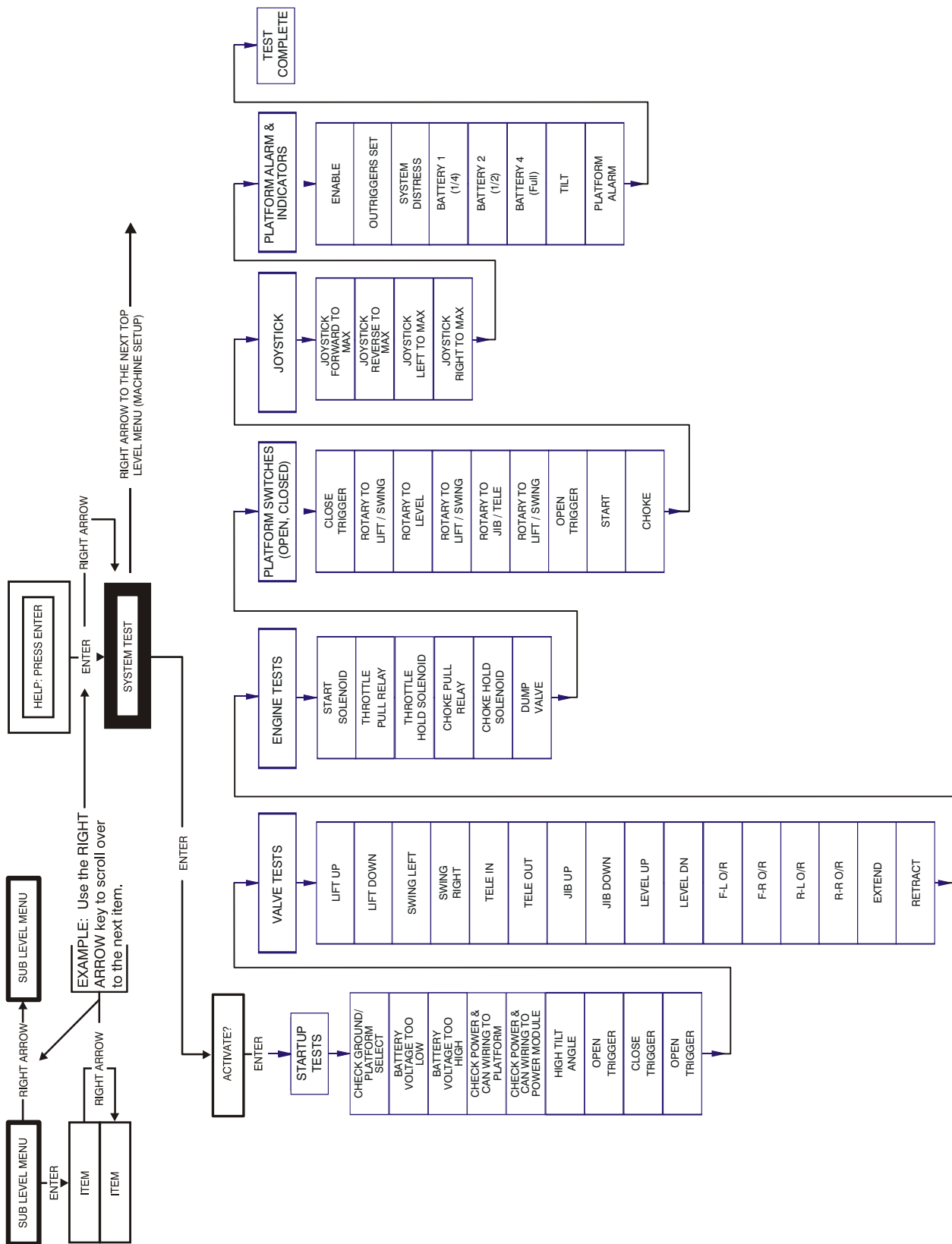


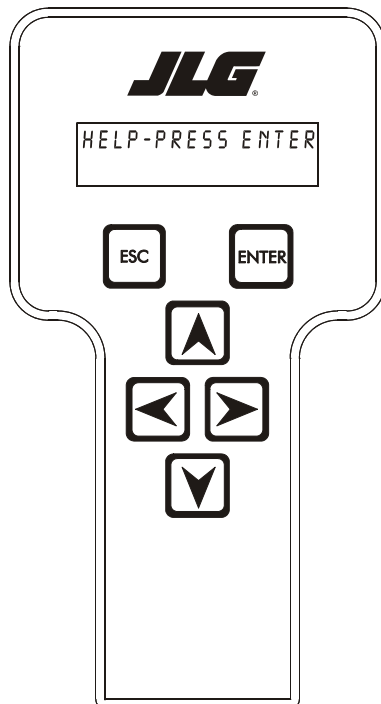
Figure 9-5. System Test Flow Chart - Platform Tests

Ground Test

1. Position the Platform/Ground select switch to the Ground position.
2. Plug the analyzer into the connector inside the Ground control box.



3. Pull out the Emergency Stop switch. and Start the engine.
4. The analyzer screen should read:



5. Use the arrow button to reach SYSTEM TEST. Hit Enter. The analyzer will prompt you asking if you want to activate the system test; hit Enter again to activate.

6. Follow the flow path in Figure 9-6., System Test Flow Chart - Ground Station Tests and go through the component tests. Hit the ESC key during any part of the test to return to the main menu without completing all tests or wait until all tests are complete. During the TEST ALL INPUTS sequence, the analyzer allows control switches to be operated and shows if they are closed (CL) or open (OP).

9.8 USER FAULT CODES

A single digit fault code blinks on the Platform and the Ground control panel to signal the operator of a procedure fault. These Codes are as follows:

- 1 --> Procedure (i.e., Did Not Close Trigger, Joystick Not Centered, etc.)
- 2 --> Vehicle Setup (i.e., Outriggers Not Set, Machine Not Level)
- 3 --> Battery Charger Engaged
- 4 --> Excessive Duty Cycle/Power Module Thermal Cutout
- 5 --> Batteries Discharged/Start Engine/Turn Off System
- 6 --> Not Used
- 7 --> Not Used
- 8 --> Not Used
- 9 --> Vehicle Requires Service

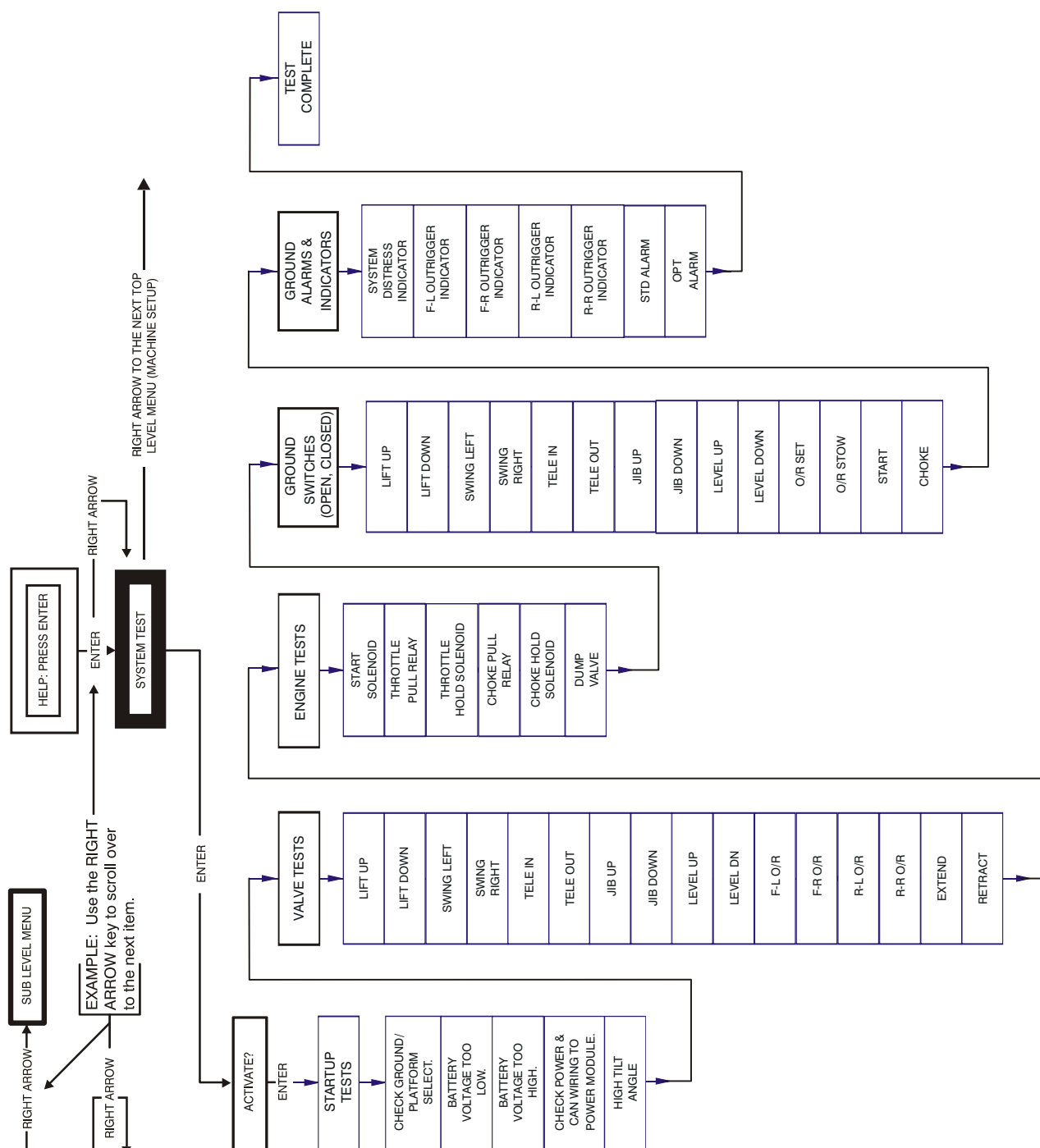


Figure 9-6. System Test Flow Chart - Ground Station Tests

SECTION 10. MULTIMETER BASICS

10.1 INTRODUCTION

A wide variety of multimeters or Volt Ohm Meters (VOM) can be used for troubleshooting your equipment. This section shows diagrams of a common, digital VOM con-

figured for several different circuit measurements. Instructions for your VOM may vary. Please consult the meter operator's manual for more information.

- If meter is not auto ranging, set it to the correct range (See multimeter's operation manual)
- Use firm contact with meter leads

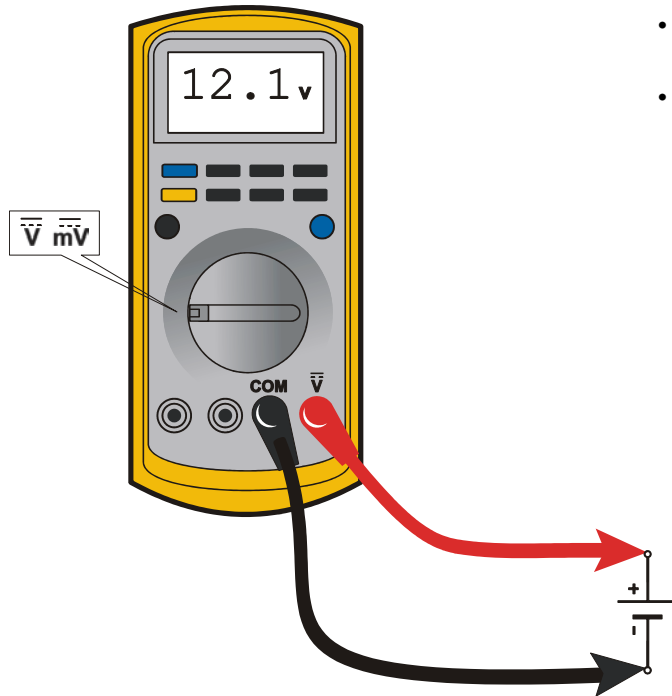
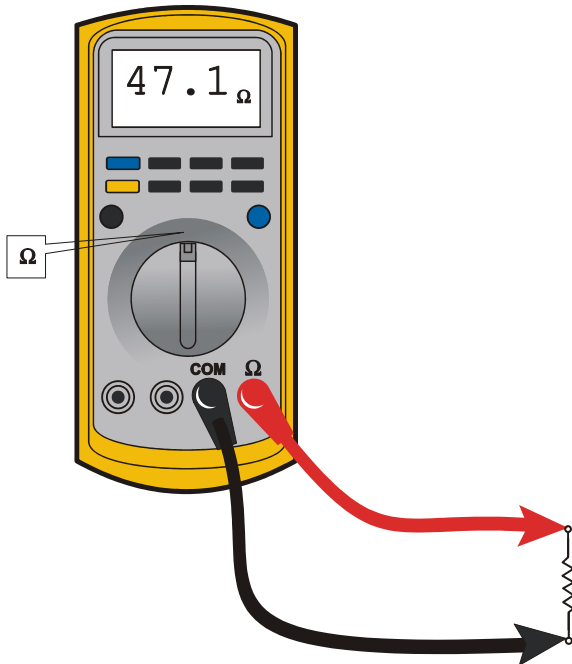
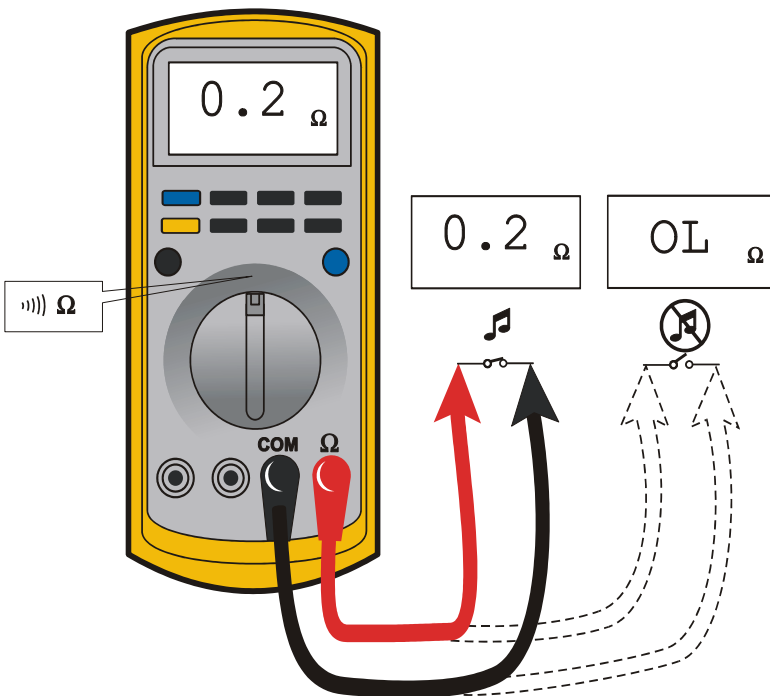


Figure 10-1. Voltage Measurement (DC)



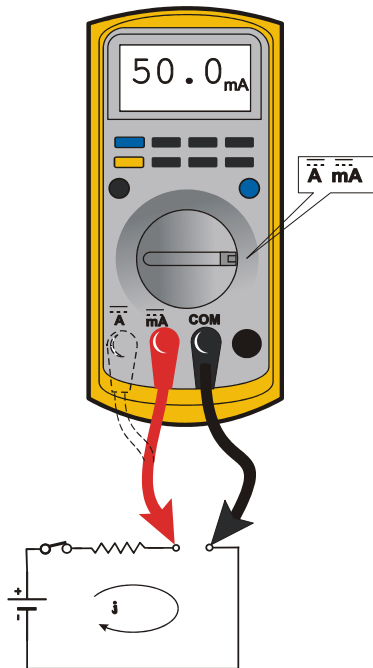
- First test meter and leads by touching leads together. Resistance should read a short circuit (very low resistance)
- Circuit power must be turned OFF before testing resistance
- Disconnect component from circuit before testing
- If meter is not auto ranging, set it to the correct range (See multimeter's operation manual)
- Use firm contact with meter leads

Figure 10-2. Resistance Measurement



- Some meters require a separate button press to enable audible continuity testing
- Circuit power must be turned OFF before testing continuity
- Disconnect component from circuit before testing
- Use firm contact with meter leads
- First test meter and leads by touching leads together. Meter should produce an audible alarm, indicating continuity

Figure 10-3. Continuity Measurement



- Set the meter for the expected current range
- Be sure to connect the meter leads to the correct jacks for the current range you have selected
- If meter is not auto ranging, set it to the correct range (See multi meter's operation manual)
- Use firm contact with meter leads

Figure 10-4. Current Measurement (DC)

SECTION 11. SPECIFICATIONS

11.1 INTRODUCTION

This section of the manual provides additional necessary information to the operator for proper operation and maintenance of this machine.

Other Publications Available:

T350 & T500J Operation and Safety Manual	3121197
T350 Service and Maintenance Manual	3121198
T500J Service and Maintenance Manual	3121200
T350 & T500J Illustrated Parts Manual.....	3121199

11.2 OPERATING SPECIFICATIONS

MODEL	T350	T500J
Tongue Weight (ANSI):	252 lbs. (114 kg)	350 lbs. (154 kg)
Maximum Allowable Tow Speed: (Do NOT exceed legal speed limit)	65 mph (105 kph)	65 mph (105 kph)
Maximum Work Load (Capacity) w/Rotator	440 lbs. (200 kg)	440 lbs. (200 kg)
Maximum Work Load (Capacity) w/o Rotator	500 lbs. (230 kg)	500 lbs. (230 kg)
Maximum Work Load (Capacity) w/Rotator & Panel Tray	320 lbs. (145 kg)	320 lbs. (145 kg)
Maximum Work Load (Capacity) w/o Rotator & w/Panel Tray	350 lbs. (158 kg)	350 lbs. (158 kg)
Material Hook Capacity (Optional)	500 lbs. (230 kg)	500 lbs. (230 kg)
Accessory Tray Capacity	250 lbs.* (114 kg)	250 lbs.* (114 kg)
Panel Tray Capacity (w/Rotator)	70 lbs. (32 kg)	70 lbs. (32 kg)
Panel Tray Capacity (w/o Rotator)	100 lbs. (45 kg)	100 lbs. (45 kg)
Swing	410° non-continuous	410° non-continuous
Max. Vertical Platform Height (Unrestricted)	35 ft. (10.6 m)	50 ft. (15.2 m)
Vertical Reach (unrestricted)	35 ft. (10.4 m)	50 ft. (15.2 m)
Horizontal Reach (from centerline of machine) (from outrigger pad edge)	20 ft. (6.1 m) 14 ft. (4.27 m)	31 ft. (9.45 m) 25 ft. (7.62 m)
Up and Over Clearance	15 ft. (4.57 m)	18 ft. (5.49 m)
Maximum Outrigger Load	1950 lbs. (884.5 kg)	2660 (1206.5 kg)
Maximum Ground Bearing Pressure	22.5 psi (1.58 kg/cm ²)	30.7 psi (2.15 kg/cm ²)
Maximum Travel Gradeability	20%	20%
Maximum Sideslope	11°	11°
Max. Hydraulic System Pressure	2700 psi (186 Bar)	2950 psi (203 Bar)
Maximum Operating Wind Speed	28 mph (12.5 m/s)	28 mph (12.5 m/s)
Maximum Horizontal Manual Force	90 lb. force (400 N)	90 lb. force (400 N)
Electrical System Voltage - Electric Machine	24 volts	24 Volts
Electrical System Voltage - Gas Machine	12 volts	12 Volts
Gross Machine Weight (Platform Empty)	3330 lbs. (1510 kg)	4750 lbs. (2155 kg)
* DO NOT exceed axle rating or GVW rating.		

Dimensional Data

Table 11-1. Dimensional Data

	T350	T500J
Overall Length		
Surge Brake, 2" ball	20 ft 5 in (6.2 m)	26 ft 9.75 in (8.2 m)
Surge Brake, 2" ball w/rotator	20 ft 11 in (6.4 m)	
Electric brake, 2" ball	20 ft 3 in (6.2 m)	26 ft 8 in (8.1 m)
Electric brake, 2" ball w/ rotator	20 ft 9 in (6.3 m)	
Surge Brake Combination, 2" ball	20 ft 11 in (6.4 m)	26 ft 10.25 in (8.2 m)
Overall Height (ANSI/CSA)	6 ft 6.25 in (2 m)	6 ft 7.25 in (2 m)
Overall Height (CE)	--	7 ft 0.5 in (2.1 m)
Overall Width (outriggers up)	4 ft 11.25 in (1.5 m)	5 ft 10.25 in (1.8 m)
Overall Width (outriggers down - ANSI)	10 ft 5.5 in (3.2 m)	12 ft 7.75 in (3.9 m)
Overall Width (outriggers down - CE)	11 ft 3 in (3.4 m)	13 ft 5.25 in (4.1 m)

Fluid Capacities

Table 11-2.

Fuel Tank	1.6 Gal. (6.0 L)
Hydraulic Tank	
Filling Volume	4.4 Gallon (16.65 Liters)
Usable Volume	4.0 Gallon (15.1 Liters)
Engine Crankcase	1.16 qt. (1.0 Liter)

Electric Power Unit

Table 11-3. Electric Power Unit Specifications

		@ 740PSI (51 Bar)	@1500PSI (103 Bar)	@ 3000PSI (207 Bar)
Motor	Power	3.0 kW	3.0 kW	3.0 kW
	Voltage	24 VDC	24 VDC	24 VDC
	Amperage	90	140	230
	Speed	4000 rpm	3600 rpm	2900 rpm
Pump	Flow Rate	3.0 gpm (11.3 lpm)	2.7 gpm (10.2 lpm)	2.2 gpm (8.3 lpm)
	Displacement	0.192 cu.in. (3.15 cc)		

Taillight and Marker Light Bulb Information

Table 11-4. Light Bulb Information

Bulb	JLG Part #
Stop/Turn/Taillight	7026341
Side Marker	7026342
Boom Taillight	7016626
Side Marker Light	7027717

Tires

Table 11-5. Tire Specifications

	T350		T500J	
	(ANSI)	(CE)	(ANSI)	(CE)
Size	205-R14	185-R14C	225-75-R15	225/75-R16
Load Rating	1760 lbs. @ 50 psi (798 kg @ 345 kPa)	1984 lbs. @ 65 psi (900 kg @450 kPa)	2540 lbs. @ 60 psi (1152 kg @ 414 kPa)	3190 lbs. @ 83 psi (1450 kg @ 575 kPa)
Ply Rating/ Load Range	6/C	8/D	6/D	10/E
Weight	36 lbs. (16 kg)	36 lbs. (16 kg)	46 lbs. (21 kg)	52 lbs. (24 kg)
Speed Category	--	S	--	R
Inflation Pressure	50 psi (345 kPa)		65 psi (448 kPa)	60 psi (414 kPa)
Wheel Nut Torque	90-120 ft. lbs. (122- 164 Nm)	66 ft. lbs. (90 Nm)	90-120 ft. lbs. (122- 164 Nm)	221 ft. lbs. (300 Nm)

Engine

Table 11-6. Engine Specifications

Type	4-stroke, overhead valve, single cylinder
Displacement	16.5 cu.in. (270 cm ³)
Bore x Stroke	3.0 x 2.3 in. (77 x 58 mm)
Max. Output	9 bhp (6.6 kW) at 3,600 rpm
Max. Torque	14.1 ft.lbs. (19.1 Nm) at 2,500 rpm
Fuel Consumption	0.51 lb/hph (313 g/kWh, 230 g/PSH)
Fuel Type	Unleaded gasoline with a pump octane rating of 86 or higher
Spark Plug	NGK: BPR6ES DENSO: W20EPR-U
Spark Plug Gap	0.028 - 0.031 in. (0.70 - 0.80 mm)

Table 11-7. Engine Battery Specifications

BCI Group Size	51R
Cranking Performance	550 amps @ 32°F (0°C) 450 amps @ 0°F (-18°C)
Reserve Capacity	80 minutes @ 32°F (0°C)

Batteries (Electric Machines)

Table 11-8. Battery Specifications

Voltage	6-Volt
Amp Hour Rating	@ 20 hour rate - 220
Reserve Capacity @ 75 Amps	110 Minutes
AT -40° F (-40° C) Open Circuit Voltage	Greater or Equal to 6 Volts
Life Cycle Rating	600 Cycles
Internal Resistance	No more than 2.5 mOhms @ 70° F (21° C) / 4.0 m Ohms @ 0° F (-18°C)
Battery Weight (minimum allowable)	61 lbs. (27.7 kg)

Component Weights

Table 11-9. Component Weights - T350

Component	Pounds (Kg)	Kilograms
Frame (bare)	592	269
Turntable (bare)	127	58
Booms & Cylinders Assy.	1130	513
Main Boom	626	284
Engine Assy. (Incl. Tray)	116	53
Engine (bare)	57	26
Master Cylinder	18	8
Axle	140	64
Platform w/Rotator	143	65
Platform w/o Rotator	73	33

Table 11-10. Component Weights - T500J

Component	Pounds	Kilograms
Frame (bare)	597	271
Frame - CE, Aus (bare)	892	382
Turntable (bare)	262	119
Booms & Cylinders Assy.	1891	859
Main Boom	957	435
Engine Assy. (Incl. Tray)	116	53
Engine (bare)	57	26
Axle		
ANSI	221	100
CE	271	123
Platform w/Rotator	143	65
Platform w/o Rotator	73	33

Lubrication

HYDRAULIC OIL

Table 11-11. Hydraulic Oil

Hydraulic System Operating Temperature Range	S.A.E. Viscosity Grade
+0° to +180° F (-18° to +83° C)	10W
+0° to +210° F (-18° to +99° C)	10W-20, 10W30
+50° to +210° F (+10° to +99° C)	20W-20

NOTE: Hydraulic oils must have anti-wear qualities at least to API Service Classification GL-3, and sufficient chemical stability for mobile hydraulic system service. JLG Industries recommends Mobilfluid 424 hydraulic oil, which has an SAE viscosity index of 152.

SECTION 11 - SPECIFICATIONS

NOTE: When temperatures remain consistently below 20 degrees F. (-7 degrees C.), JLG Industries recommends the use of Mobil DTE13.

Aside from JLG recommendations, it is not advisable to mix oils of different brands or types, as they may not contain the same required additives or be of comparable viscosities. If use of hydraulic oil other than Mobilfluid 424 is desired, contact JLG Industries for proper recommendations.

Table 11-12. Mobilfluid 424 Specs

SAE Grade	10W30
Gravity, API	29.0
Density, Lb/Gal. 60 F	7.35
Pour Point, Max	-46°F (-43°C)
Flash Point, Min.	442°F (228°C)
Viscosity	
Brookfield, cP at -18°C	2700
at 40° C	55 cSt
at 100° C	9.3 cSt
Viscosity Index	152

PROPOSITION 65 WARNING

- **Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm.**
- **Batteries also contain other chemicals known to the State of California to cause cancer.**
- **Wash hands after handling.**



WARNING:



The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

1702961



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